

WTS ACADEMY



WTS MATHS 12

FUNCTIONS SOLUTIONS

EMAIL

: admin@kwv-education.co.za

FACEBOOK P.

: KWV EDUCATION

FREE YOUTUBE

: @KWVEDUCATION

INSTAGRAM

: KWVEDUCATION

WHATSAPP GROUP

: 082 6727 928

WEBSITE

: www.kwv-education.co.za



MATHS AND SCIENCE
TUTORING

WTS TUTORING PROGRAMMES

WEEKEND CROSSDAYS
AND CROSSNIGHTS

QUARTERLY CAMPS

BOARDING HOUSE

ONLINE TUTORING

MATRIC UPGRADING CENTERS

- ✓ Durban
- ✓ Richards Bay

ONE-ON-ONE CENTERS

- | | |
|--------------------|--------------------|
| ✓ Richards Bay | ✓ Ixopo/ Mzimkhulu |
| ✓ Durban | ✓ NewCastle |
| ✓ Pietermaritzburg | ✓ Vryheid |
| ✓ Mzingazi | ✓ Port-Shepstone |
| ✓ Empangeni | ✓ Stanger |
| ✓ Eskhawini | ✓ Ulundi |
| ✓ Mtuba-Tuba | ✓ Lady Smith |
| ✓ Mandeni | ✓ Jozini |
| ✓ Eastern Cape | ✓ Gauteng |

WTS IS FOR THE NATION

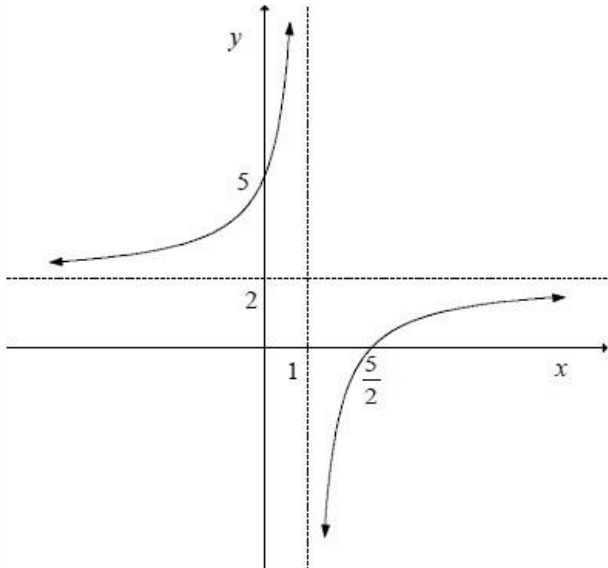
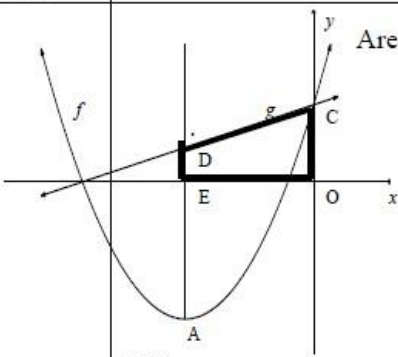
f WTS Maths and Science Tutoring

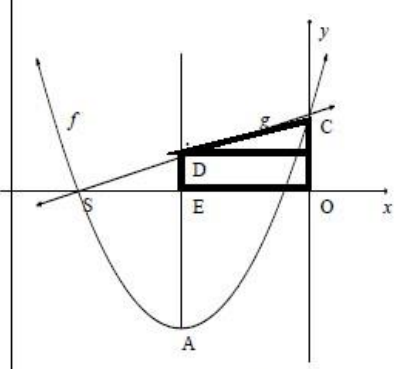
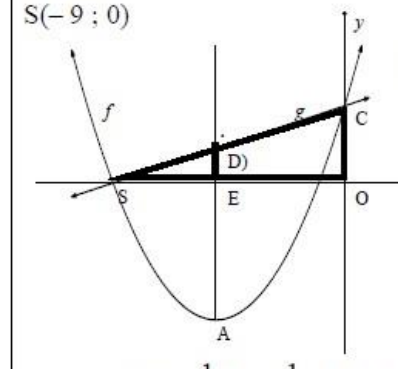
www.wtstutor.co.za

082 672 7928 OR 065 744 4429

KWV 01 MEMO

QUESTION/VRAG 4

4.1.1	$x = 1$ $y = 2$	✓ $x = 1$ ✓ $y = 2$ (2)
4.1.2	$y = mx + c$ $2 = -1 + c$ or $y - y_1 = m(x - x_1)$ or $y = -(x - p) + q$ $c = 3$ $y = -x + 3$	✓ substitution of $m = -1$ and $(1; 2)$ ✓ answer (2)
4.1.3		✓ vertical asymptote: $x = 1$ and horizontal asymptote: $y = 2$ ✓ x-intercept: $\frac{5}{2}$ ✓ y-intercept: 5 ✓ shape (A) (4)
4.2.1	$(-5; -8)$	✓ $x = -5$ ✓ $y = -8$ (2)
4.2.2	$y \geq -8$ or $[-8; \infty)$	✓ answer (1)
4.2.3	$m = -5$ $n = g(-5)$ $= \frac{1}{2}(-5) + \frac{9}{2}$ $= 2$	✓ $m = -5$ ✓ substitution ✓ $n = 2$ (3)
4.2.4	 Area trapezium = $\frac{1}{2}(DE + OC) \times OE$ $= \frac{1}{2}(2 + 4,5) \times 5$ $= \frac{65}{4}$ or 16,25 OR	✓ method ✓ correct substitution ✓ answer (3) OR

	 $\text{Area } \Delta = \frac{1}{2} b.h$ $= \frac{1}{2} (5) \left(\frac{5}{2} \right)$ $= \frac{25}{4}$ $\text{Area rect} = b.h$ $= (5)(2)$ $= 10$ $\text{Area trapezium} = \frac{25}{4} + 10 = \frac{65}{4} \text{ or } 16,25$ OR S(-9 ; 0)  $\text{Area } \Delta \text{ SOC} = \frac{1}{2} b.h$ $= \frac{1}{2} (9) \left(\frac{9}{2} \right)$ $= \frac{81}{4}$ $\text{Area } \Delta \text{ SED} = \frac{1}{2} b.h = \frac{1}{2} (4)(2) = 4$ $\text{Area trapezium} = \text{area } \Delta \text{ SOC} - \text{Area } \Delta \text{ SED}$ $= \frac{81}{4} - 4$ $= \frac{65}{4} \text{ or } 16,25$	✓ method ✓ correct substitution ✓ answer (3) OR ✓ method ✓ correct substitution ✓ answer (3)
4.2.5	$g^{-1}: x = \frac{1}{2}y + \frac{9}{2}$ $g^{-1}: y = 2x - 9$	✓ changing x and y ✓ answer (2)

4.2.6	$f(x) = \frac{1}{2}(x+5)^2 - 8$ $f(x) = \frac{1}{2}(x^2 + 10x + 25) - 8$ $f(x) = \frac{1}{2}x^2 + 5x + 4,5$ $f'(x) = x + 5$ $h(x) = 2x - 9 + k$ $x + 5 = 2$ $x = -3 \quad y = -6$ $(-3; -6)$ OR $f(x) = h(x)$ $\frac{1}{2}(x+5)^2 - 8 = 2x - 9 + k$ $\frac{1}{2}x^2 + 3x + \frac{27}{2} - k = 0$ $x = \frac{-3}{2\left(\frac{1}{2}\right)} = -3 \quad b^2 - 4ac = 0$ $y = -6$ $(-3; -6)$	$\checkmark f'(x)$ $\checkmark x + 5 = 2$ $\checkmark x = -3 \quad \checkmark y = -6$ (4) OR $\checkmark$ equating $\checkmark$ turning point / $\Delta = 0$ $\checkmark x = -3 \quad \checkmark y = -6$ (4)
		[23]

QUESTION/VRAAG 5

5.1	A(0 ; 1)	$\checkmark$ answer (1)
5.2	$9 = 3^{-x}$ $3^2 = 3^{-x}$ $x = -2$ B(-2 ; 9)	$\checkmark$ equating $\checkmark 3^2 = 3^{-x}$ $\checkmark x = -2$ (3)
5.3	$x \in (0; \infty)$ or $x > 0$	$\checkmark \checkmark$ answer (2)
5.4	$h(x) = 27 \cdot 3^{-x}$ $h(x) = 3^{-(x-3)}$ f shifted 3 units to the right	$\checkmark h(x) = 3^{-(x-3)}$ $\checkmark$ 3 units $\checkmark$ right (3)
5.5	$\frac{27}{3^x} < 1$ $3^{-x+3} < 1$ $3^x > 27$ or $3^{-x+3} < 3^0$ $3^x > 3^3$ $-x + 3 < 0$ $x > 3$ $x > 3$ OR The graph shifts 3 units to the right Thus the y-intercept shift 3 units to the right (3 ; 1) $\therefore x > 3$	$\checkmark 3^x > 27$ or $3^{-x+3} < 3^0$ $\checkmark 3^x > 3^3$ or $-x + 3 < 0$ $\checkmark x > 3$ (3) OR $\checkmark$ translation $\checkmark$ y-intercept $\checkmark$ answer (3)
		[12]

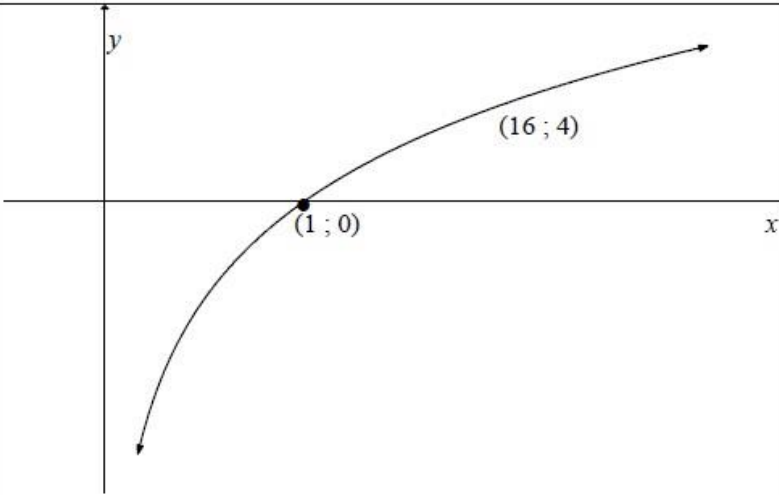
KWV 02 MEMO

QUESTION/VRAAG 4

4.1	$p = -1$	✓ $p = -1$ (1)
4.2	$y = \frac{a}{x-1}$ $-3 = \frac{a}{0-1}$ $a = 3$ $y = x^2 + bx - 3$ $0 = (1)^2 + (1)b - 3$ $b = 2$	✓ coordinates D(0 ; -3) ✓ substitute (0 ; -3) ✓ substitute (1 ; 0) (3)
4.3	$y = x^2 + 2x - 3$ axis of sym: $x = \frac{-b}{2a}$ $x = \frac{-2}{2(1)}$ $x = -1$ $y = (-1)^2 + 2(-1) - 3 = -4$ C(-1; -4) OR/OF $\frac{dy}{dx} = 0$ $2x + 2 = 0$ $x = -1$ $y = (-1)^2 + 2(-1) - 3 = -4$ C(-1; -4)	✓ substitution ✓ $x = -1$ ✓ substitution ✓ $y = -4$ (4) OR/OF ✓ derivative ✓ $x = -1$ ✓ substitution ✓ $y = -4$ (4)
4.4	$y \in [-4; \infty)$ or $y \geq -4$	✓ -4 ✓ answer (2)
4.5	$m = \tan 45^\circ = 1$ $y = mx + c$ $-4 = (1)(-1) + c$ $c = -3$ $y = x - 3$	✓ gradient ✓ subs m and $(-1; -4)$ ✓ equation (3)
4.6	No, the line passes through C and D OR/OF No, a tangent through turning point C will have a gradient of 0	✓ No ✓ reason (2) OR/OF ✓ No ✓ reason (2)

4.7	$f(m-x) = f[-(x-m)]$ f is reflected in the y-axis and translated 1 unit to the left and 4 units upwards. Therefore: $m = -1$ $q = 4$ OR/OF Substitute $x = 0$ and $q = 4$ for one x- intercept $h(x) = (m-x)^2 + 2(m-x) - 3 + q$ $h(0) = (m-0)^2 + 2(m-0) - 3 + 4$ $0 = m^2 + 2m + 1$ $0 = (m+1)^2$ $m = -1$ $q = 4$	✓✓ value of m ✓✓ value of q (4) OR/OF ✓✓ value of m ✓✓ value of q (4)
		[19]

QUESTION/VRAAG 5

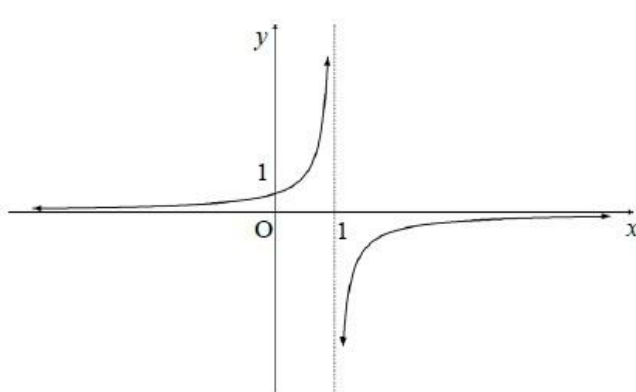
5.1	$f(x) = k^x$ $16 = k^4$ $k = 2$	✓ substitution (4 ; 16) ✓ answer (2)
5.2	$f: y = 2^x$ $f^{-1}: x = 2^y$ $y = \log_2 x$	✓ $x = 2^y$ ✓ $y = \log_2 x$ (2)
5.3		✓ asymptote ✓ shape ✓ for any two valid points eg. (16 ; 4) or (2 ; 1) or (4 ; 2) or (1 ; 0) (4)
5.4.1	$x \in (1 ; \infty)$ or $x > 1$	✓ 1 ✓ answer (2)
5.4.2	$0 < x \leq \frac{1}{2}$ or $x \in \left(0; \frac{1}{2}\right]$	✓ $\frac{1}{2}$ ✓ answer (2)

KWV 03 MEMO

QUESTION/VRAAG 4

4.1	Yes For every x -value there is only one corresponding y value OR/OF One to one mapping (vertical line test)	✓ answer ✓ reason (2)
4.2	$R(-12; -6)$	✓ answer (1)
4.3	$f(x) = ax^2$ substitute $(-6; -12)$ $-12 = a(-6)^2$ $a = \frac{-1}{3}$	✓ substitution ✓ answer (2)
4.4	$f: y = -\left(\frac{1}{3}\right)x^2$ $f^{-1}: x = -\left(\frac{1}{3}\right)y^2$ $y^2 = -3x$ $y = \pm\sqrt{-3x}$ Only $y = -\sqrt{-3x}$ and $x \leq 0$	✓ swapping x and y ✓ $y^2 = -3x$ ✓ $y = -\sqrt{-3x}$ (3)
		[8]

QUESTION/VRAAG 5

5.1	Domain: $x \in \mathbb{R}; x \neq 1$ OR/OF $x \in (-\infty; 1) \cup (1; \infty)$	✓ answer (1)
5.2	$x = 1$ $y = 0$	✓ $x = 1$ ✓ $y = 0$ (2)
5.3		✓ y intercept ✓ vertical asymptote ✓ shape (3)
5.4	$x \geq 0; x \neq 1$ OR/OF $0 \leq x < 1$ or $x > 1$ OR/OF $x \in [0; 1) \cup (1; \infty)$	✓ $x \geq 0$ ✓ $x \neq 1$ OR/OF ✓ $0 \leq x < 1$ ✓ $x > 1$ (2)
		[8]

QUESTION/VR44G 6

6.1	$y = mx + c$ $m = \frac{5-1}{4-0}$ $m = 1$ $c = 1$ $g(x) = x + 1$ OR/OF $y = mx + c$ $5 = m(4) + 1$ $m = 1$ $g(x) = x + 1$	✓ substitution into gradient formula ✓ y-intercept (0 ; 1) (2) OR/OF ✓ substitute (4 ; 5) ✓ c = 1 (2)
6.2	$x^2 - 2x - 3 = 0$ $(x+1)(x-3) = 0$ $x = -1$ or $x = 3$ A(-1 ; 0) B(3 ; 0)	✓ y = 0 ✓ factors ✓ x-values (3)
6.3	$x = \frac{-1+3}{2}$ or $x = \frac{-b}{2a} = \frac{-(-2)}{2(1)}$ or $f'(x) = 2x - 2 = 0$ $x = 1$ $f(x) = x^2 - 2x - 3$ $y = (1)^2 - 2(1) - 3$ or $y = (x^2 - 2x + (-1)^2) - 3 - 1$ $y = -4$ $y \geq -4$ or $[-4; \infty)$	✓ x-value ✓ substitution/ completing the square ✓ answer (3)
6.4.1	MN: $y = (x^2 - 2x - 3) - (x + 1)$ $= x^2 - 3x - 4$ $6 = x^2 - 3x - 4$ $0 = x^2 - 3x - 10$ $0 = (x-5)(x+2)$ $x = 5$ or $x = -2$ OT = 2 or OT = 5 NA	✓ $x^2 - 3x - 4$ ✓ substituting $y = 6$ ✓ values of x ✓ OT = 2 (4)
6.4.2	$y = x + 1$ substitute $x = -2$ $= (-2) + 1$ $= -1$ N(-2 ; -1)	✓ substituting $x = -2$ ✓ answer (2)

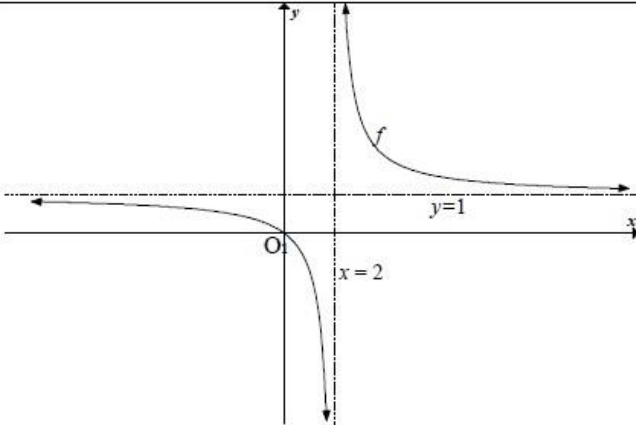
6.5	$f'(x) = 2x - 2$ $2x - 2 = 1$ $x = \frac{3}{2}$ $f\left(\frac{3}{2}\right) = \frac{-15}{4}$ $y + \frac{15}{4} = 1\left(x - \frac{3}{2}\right)$ or $-\frac{15}{4} = \frac{1}{2} + c$ $y = x - \frac{21}{4}$ OR/OF $x^2 - 2x - 3 = x + p$ $x^2 - 2x - 3 - x - p = 0$ This equation will have equal roots, therefore: $b^2 - 4ac = 0$ $(-3)^2 - 4(1)(-3 - p) = 0$ $9 + 12 + 4p = 0$ $p = \frac{-21}{4}$ $y = x - \frac{21}{4}$	$\checkmark f'(x) = 2x - 2$ $\checkmark 2x - 2 = 1$ $\checkmark x = \frac{3}{2}$ $\checkmark f\left(\frac{3}{2}\right) = \frac{-15}{4}$ $\checkmark$ answer (5) OR/OF $\checkmark$ equating $\checkmark$ equal roots $\checkmark$ substitution $\checkmark$ simplification $\checkmark$ answer (5)
6.6	$k < \frac{-21}{4}$	$\checkmark$ answer (1)
		[20]

KWV 04 MEMO

QUESTION/VRAG 4

4.1	E(4 ; -9)	$\checkmark x = 4$ $\checkmark y = -9$ (2)
4.2	$f(x) = (x-4)^2 - 9$ $(x-4)^2 - 9 = 0$ $(x-4)^2 = 9$ $x-4 = \pm 3$ $x = 7 \quad \text{or} \quad x = 1$ A(1 ; 0) OR/OF $f(x) = (x-4)^2 - 9$ $0 = x^2 - 8x + 16 - 9$ $0 = x^2 - 8x + 7$ $(x-7)(x-1) = 0$ $x = 7 \quad \text{or} \quad x = 1$ A(1 ; 0)	$\checkmark y = 0$ $\checkmark x - 4 = \pm 3$ $\checkmark A(1 ; 0)$ OR/OF $\checkmark y = 0$ $\checkmark (x-7)(x-1)$ $\checkmark A(1 ; 0)$ (3)
4.3	C(0 ; 7) M(8 ; 7) NOTE: Answer only 3 / 3	$\checkmark C(0 ; 7)$ $\checkmark x = 8$ $\checkmark y = 7$ (3)
4.4	C(0 ; 7) D(4 ; 0) $m = \frac{7-0}{0-4} \quad \text{or} \quad m = \frac{0-7}{4-0} \quad \text{or} \quad 0 = 4m + 7$ $m = -\frac{7}{4} \quad m = -\frac{7}{4} \quad m = -\frac{7}{4}$ $y - 0 = -\frac{7}{4}(x - 4)$ $y = -\frac{7}{4}x + 7$	$\checkmark D(4 ; 0)$ $\checkmark m = -\frac{7}{4}$ $\checkmark y = -\frac{7}{4}x + 7$ (3)
4.5	$g : y = -\frac{7}{4}x + 7$ $g^{-1} : x = -\frac{7}{4}y + 7$ $4x = -7y + 28$ $7y = -4x + 28$ $y = -\frac{4}{7}x + 4$ OR/OF	$\checkmark$ interchange x and y $\checkmark$ simplification $\checkmark y = -\frac{4}{7}x + 4$ OR/OF

QUESTION/VR4AG 6

6.1	$q = 1$	✓ $q = 1$ (1)
6.2	Subs $(0;0)$ $0 = \frac{a}{0+p} + 1$ $\frac{a}{p} = -1$ $a = -p$ Subs P: $\sqrt{2} + 1 = \frac{a}{\sqrt{2} + 2 + p} + 1$ $\sqrt{2} = \frac{a}{\sqrt{2} + 2 + p}$ $2 + 2\sqrt{2} + \sqrt{2}p = a$ $2 + 2\sqrt{2} = a - p\sqrt{2} = a + a\sqrt{2}$ $2(1 + \sqrt{2}) = a(1 + \sqrt{2})$ $a = 2 ; p = -2$ NOTE: Answer only 2 / 5	✓ $0 = \frac{a}{0+p} + 1$ ✓ $a = -p$ ✓ substitution ✓ $a = 2$ ✓ $p = -2$ (5)
6.3		✓ $y = 1$ ✓ $x = 2$ ✓ shape ✓ $(0; 0)$ (4) [10]

KWV 05 MEMO

QUESTION/VRAAG 4

4.1	$f(x) = -ax^2 + bx + 6$ $f'(x) = -2ax + b$ $-2ax + b = 3$ $\text{at } x = -1$ $2a + b = 3 \quad [1]$ $f(-1) = \frac{7}{2}$ $-a - b + 6 = \frac{7}{2}$ $-2a - 2b + 12 = 7$ $2a + 2b = 5 \quad [2]$ $[2] - [1]$ $b = 2$ $2a + 2 = 3$ $a = \frac{1}{2}$ OR/OF $f'(x) = -2ax + b$ $3 = 2a + b$ $b = 3 - 2a$ $\frac{7}{2} = -a(-1)^2 + (3 - 2a)(-1) + 6$ $a + 3 = \frac{7}{2}$ $a = \frac{1}{2}$ $b = 2$	$\checkmark -2ax + b$ $\checkmark \checkmark 2a + b = 3$ $\checkmark -a - b + 6 = \frac{7}{2}$ $\checkmark \text{solve simultaneously}$ (5)
4.2	$f(x) = -\frac{1}{2}x^2 + 2x + 6$ $x - \text{intercepts:}$ $-\frac{1}{2}x^2 + 2x + 6 = 0$ $-x^2 + 4x + 12 = 0$ $x^2 - 4x - 12 = 0$ $(x - 6)(x + 2) = 0$ $(-2; 0) \quad (6; 0)$	$\checkmark -\frac{1}{2}x^2 + 2x + 6 = 0$ $\checkmark (-2; 0)$ $\checkmark (6; 0)$ (3)

4.3	$f(x) = -\frac{1}{2}x^2 + 2x + 6$ $f'(x) = 0 \quad \text{or} \quad x = -\frac{b}{2a} \quad \text{or} \quad x = \frac{-2+6}{2}$ $-x+2=0 \quad x = -\frac{2}{2\left(-\frac{1}{2}\right)} \quad x = 2$ $x = 2 \quad x = 2$ $y = -\frac{1}{2}(2)^2 + 2(2) + 6$ $= -2 + 4 + 6$ $= 8$ $\text{TP}(2; 8)$ OR/OF $y = -\frac{1}{2}(x^2 - 4x - 12)$ $= -\frac{1}{2}[(x-2)^2 - 4 - 12]$ $= -\frac{1}{2}(x-2)^2 + 8$ $\text{TP}(2; 8)$	$\checkmark -x+2 \quad / \quad -\frac{2}{2\left(-\frac{1}{2}\right)} \quad /$ $\frac{-2+6}{2}$ $\checkmark x = 2$ $\checkmark y = 8$ OR/OF $\checkmark -\frac{1}{2}(x-2)^2 + 8$ $\checkmark x = 2$ $\checkmark y = 8$ (3)
4.4 4.6		4.4: f: $\checkmark \text{shape}$ $\checkmark \text{x-intercepts}$ $\checkmark \text{y-intercept}$ $\checkmark (2; 8)$ (4) 4.6: g: $\checkmark \text{x-intercept}$ $\checkmark \text{y-intercept}$ (2)
4.5	$0 < x < 4 \quad \text{or} \quad (0; 4)$	$\checkmark 4$ $\checkmark \checkmark 0 < x < 4 \quad (3)$
4.7	$x \leq -2 \quad \text{or} \quad -1 \leq x \leq 6$ OR/OF $(-\infty; -2] \quad \text{or} \quad [-1; 6]$	$\checkmark x \leq -2$ $\checkmark \checkmark -1 \leq x \leq 6$ (3) [23]

5.1	$y \in R; y \neq -1$ OR/OF $y < -1$ or $y > -1$ OR/OF $y \in (-\infty; -1)$ or $y \in (-1; \infty)$ OR/OF $R - \{-1\}$	✓✓ answer
5.2	$D(2; -1)$ $g(x) = \frac{2}{x-2} - 1$	$\checkmark D(2; -1)$ $\checkmark \frac{2}{x-2} - 1$
5.3	$f(x) = \log_3 x.$ $\log_3 t = 1$ OR/OF $g(x) = \frac{2}{x-2} - 1$ $t = 3$ $1 = \frac{2}{t-2} - 1$ $2 = \frac{2}{t-2}$ $2t - 4 = 2$ $t = 3$	$\checkmark$ correct substitution of A $\checkmark \checkmark t = 3$
5.4	$x = \log_3 y$ $y = 3^x$	$\checkmark$ interchange x and y $\checkmark y = 3^x$
5.5	$3^x < 3^1$ $x < 1$ OR/OF $3^x < 3^1$ $x \in (-\infty ; 1)$	$\checkmark 3^x < 3^1$ $\checkmark x < 1$ $\checkmark 3^x < 3^1$ $\checkmark x \in (-\infty ; 1)$
5.6	Equation of the axis of symmetry: $y = -x + 1$ x-intercept of the axis of symmetry is at $x = 1$ f has an x-intercept at B(1 ; 0) which is the same as the x-intercept of the axis of symmetry Point of intersection: B (1 ; 0) OR/OF Since BE = ED = 1 and D lies on the axis of symmetry and the gradient of the axis of symmetry is -1, B will also lie on the axis of symmetry. But B also lies on f. Therefore B(1 ; 0) is the point of intersection between f and the axis of symmetry with a negative gradient./ Omdat BE = ED = 1 en D op die simmetrie-as lê en die simmetrie-as se gradiënt -1 is, sal B ook op die simmetrie-as lê. Maar B lê ook op f. Dus is B(1 ; 0) die snypunt van f en die simmetrie-as met negatiewe gradiënt.	$\checkmark \checkmark$ equation of axis of symmetry $\checkmark$ B or (1 ; 0) OR/OF $\checkmark \checkmark$ BE = ED = 1 $\checkmark$ B or (1 ; 0)

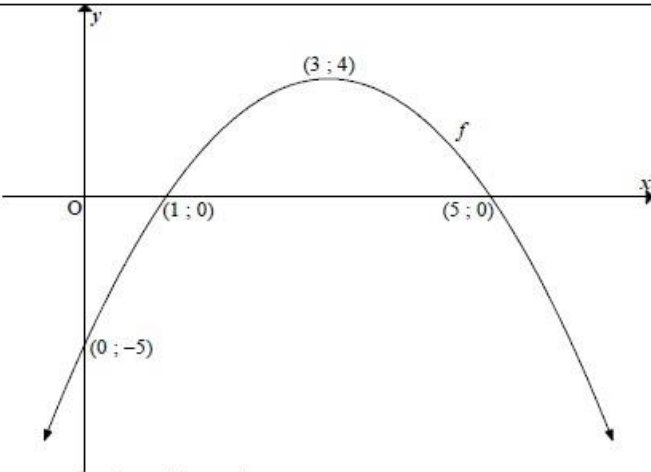
KWV 06 MEMO

QUESTION/VRAG 4

4.1	$U(1; 0)$	✓ $(1; 0)$ (1)
4.2	$x = 1$ $y = 1$	✓ $x = 1$ ✓ $y = 1$ (2)
4.3	$\frac{2}{x-1} + 1 = 0$ $2 = -x + 1$ $x = -1$ $T(-1; 0)$	✓ $y = 0$ ✓ $x = -1$ (2)
4.4	$f(x) = \log_5 x$ $h: x = \log_5 y$ $y = 5^x$	✓ change x and y ✓ $y = 5^x$ (2)
4.5	$y = 0$	✓ answer (1)
4.6	$V(\sqrt{2} + 1; \sqrt{2} + 1)$ $V(2, 41; 2, 41)$ OR / OF $x = \frac{2}{x-1} + 1$ $x^2 - x = 2 + x - 1$ $x^2 - 2x - 1 = 0$ $x = \frac{2 \pm \sqrt{4 - 4(1)(-1)}}{2}$ $= \frac{2 \pm \sqrt{8}}{2}$ $= \frac{2 \pm 2\sqrt{2}}{2}$ $= 1 \pm \sqrt{2}$ $V(1 + \sqrt{2}; 1 + \sqrt{2})$ OR / OF $x - 1 = \frac{2}{x-1}$ $(x-1)^2 = 2$ $x = 1 \pm \sqrt{2}$ $V(1 + \sqrt{2}; 1 + \sqrt{2})$	✓ ✓ $\sqrt{2} + 1$ ✓ ✓ $\sqrt{2} + 1$ (4) ✓ $x = \frac{2}{x-1} + 1$ ✓ subs into correct formula ✓ $x = \sqrt{2} + 1$ ✓ $y = \sqrt{2} + 1$ (4) ✓ $x - 1 = \frac{2}{x-1}$ ✓ $(x-1)^2 = 2$ ✓ $x = \sqrt{2} + 1$ ✓ $y = \sqrt{2} + 1$ (4)
4.7	$T'(3; 2)$	✓ $x = 3$ ✓ $y = 2$ (2) [14]

QUESTION 5

5.1.1	$C(0; -3)$	✓ $C(0; -3)$ (1)
5.1.2	$f(x) = x^2 - 2x - 3$ $(x-3)(x+1) = 0$ $x = -1$ or $x = 3$ $AB = 3 - (-1)$ $AB = 4$ units	✓ factors ✓ x-value ✓ other x-value ✓ answer (4)
5.1.3	$x = \frac{2}{2(1)}$ or $2x - 2 = 0$ or $x = \frac{-1+3}{2}$ $= 1$ $y = (1)^2 - 2(1) - 3$ $= -4$ $D(1; -4)$	✓ $x = 1$ ✓ y value (2)
5.1.4	$C(0; -3)$ $D(1; -4)$ Average gradient / <i>Gemiddelde gradiënt</i> $= \frac{-4+3}{1-0}$ or $\frac{-3+4}{0-1}$ $= -1$	✓ $\frac{-4+3}{1-0}$ or $\frac{-3+4}{0-1}$ ✓ -1 (2)
5.1.5	$OC = OB = 3$ $\hat{OCB} = 45^\circ$ isosceles right angled triangle <i>Gelykbenige reghoekige driehoek</i> OR / OF $\tan \beta = m_g$ $\tan \beta = 1$ $\beta = 45^\circ$ $\hat{OBC} = 45^\circ$ $\hat{OCB} = 45^\circ$	✓ equal lengths ✓ 45° (2) ✓ $\tan \beta = 1$ ✓ 45° (2)
5.1.6	$-4 < k < -3$ OR $(-4; -3)$	✓ -4 ✓ -3 ✓ notation (3)
5.1.7	$f'(x) \cdot f''(x) > 0$ $(2x-2) \cdot 2 > 0$ $2x-2 > 0$ $x > 1$	✓ $2x-2$ ✓ 2 ✓ $x > 1$ (3)

5.2	 $f(x) = a(x-1)(x-5)$ $4 = a(3-1)(3-5)$ $4 = -4a$ $a = -1$ $f(x) = -x^2 + 6x - 5$	TP ✓ $x = 3$ ✓ $y = 4$ ✓ x - intercepts ✓ y-intercept ✓ shape (5)
		[22]

KWV 07 MEMO

QUESTION/VRAAG 4

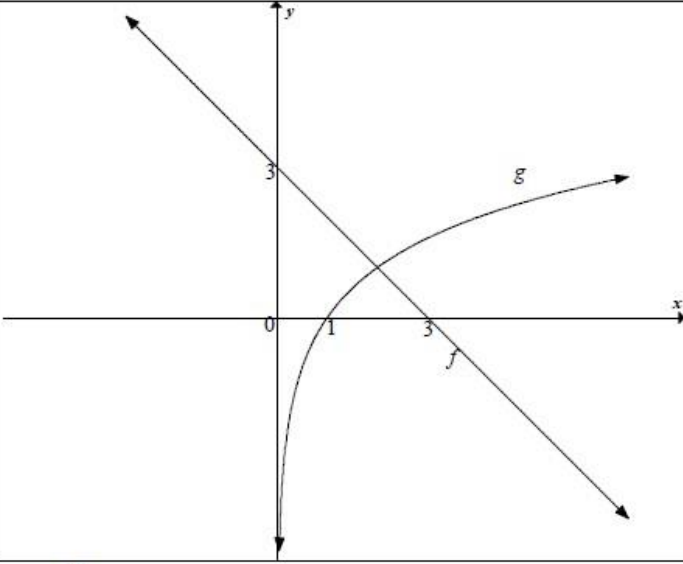
4.1	$y = 0$	✓ $y = 0$ (1)
4.2	$R(0 ; 1)$	✓ answer (1)
4.3	$y = a^x$ $9 = a^2$ $\therefore a = 3$	✓ substitution ✓ $a = 3$ (2)
4.4	$DP = 2 - b$ $y = 3^x$ $\frac{1}{81} = 3^b$ $3^{-4} = 3^b$ $b = -4$ $DP = 2 - (-4)$ $= 6 \text{ units}$	✓ $\frac{1}{81} = 3^b$ ✓ 3^{-4} or use of logs ✓ $b = -4$ ✓ $DP = 6 \text{ units}$ (4)
4.5	$h(x + 2) + k = 0$ $h(x + 2) = -k$ $0 < -k < \frac{1}{81}$ $-\frac{1}{81} < k < 0$	✓✓ $-k < \frac{1}{81}$ or $k > -\frac{1}{81}$ ✓ $-\frac{1}{81} < k < 0$ (3)
		[11]

QUESTION/VRAAG 5

5.1	$f(x) = -x^2 + 4x - 3$ $f'(x) = 0$ or $x = -\frac{4}{2(-1)}$ $-2x + 4 = 0$ $x = 2$ $y = -(2)^2 + 4(2) - 3$ $= 1$ $B(2; 1)$ OR/OF $-x^2 + 4x - 3 = 0$ $x^2 - 4x + 3 = 0$ $(x-3)(x-1) = 0$ $x = 3$ or $x = 1$ $x = \frac{3+1}{2}$ $x = 2$ $y = -(2)^2 + 4(2) - 3$ $= 1$ $B(2; 1)$	$\checkmark -2x + 4 = 0$ or $x = -\frac{4}{2(-1)}$ $\checkmark y = -(2)^2 + 4(2) - 3$ (2) $\checkmark x = \frac{3+1}{2}$ $\checkmark y = -(2)^2 + 4(2) - 3$ (2)
5.2	Range/Waardeversameling : $y \leq 1$ OR/OF Range/Waardeversameling : $y \in (-\infty; 1]$	$\checkmark y \leq 1$ (1) $\checkmark (-\infty; 1]$ (1)
5.3	$x \leq -1$ or $x > 2$ OR/OF $(-\infty; -1] \cup (2; \infty)$	$\checkmark$ critical values $\checkmark x \leq -1$ or $x > 2$ (2) $\checkmark$ critical values $\checkmark x \leq -1$ or $x > 2$ (2)
5.4	$(x-p)(y+t) = 3$ Vertical asymptote of $h(x)$ / <i>vertikale asimptoot</i> at $x = 2$ Translation 4 units to the left / <i>Translasie 4 eenhede links</i> $x = 2 - 4 = -2$ is the equation of the vertical asymptote of $h(x+4)$ $x = 2 - 4 = -2$ is die vergelyking van die vertikale asimptoot OR/OF	$\checkmark x = -2$ (1)

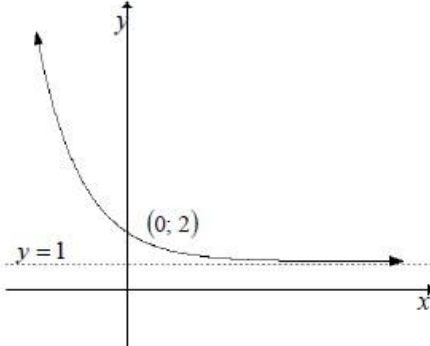
	OR/OF $h(x) = \frac{3}{x-2+4} + 1$ $= \frac{3}{x+2} + 1$ $x = -2$ is the equation of the vertical asymptote / <i>is die vergelyking van die vertikale asimptoot</i>	✓ $x = -2$ (1)
5.5	$(x-p)(y+t) = 3$ $(y+t) = \frac{3}{(x-p)}$ $y = \frac{3}{x-p} - t$ B(2;1) Point of intersection of the asymptotes <i>Snypunt van die asimptote</i> $p = 2$ $-t = 1$ $t = -1$	✓ $\frac{3}{x-p}$ ✓ $-t$ ✓ $p = 2$ ✓ $t = -1$ (4)
5.6	x-intercepts of f / x-afsnitte van f: $x^2 - 4x + 3 = 0$ $(x-3)(x-1) = 0$ $x = 1 \text{ or } x = 3$ $g'(x) < 0 \text{ for } x \in R; x \neq 2$ Hence $f(x) < 0$ $x \leq 1 \text{ or } x \geq 3 \quad \text{OR/OF} \quad (-\infty; 1] \cup [3; \infty)$	✓ both critical values ✓ $x \leq 1$ ✓ or ✓ $x \geq 3$ (4) [14]

QUESTION/VRAG 6

6.1		g: ✓ shape: increasing curve ✓ (1 ; 0): only on log graph f: ✓ (3 ; 0) ✓ (0 ; 3)	(4)
6.2	$y = \log_2 x$ $g^{-1}: x = \log_2 y$ $y = 2^x$	✓ interchange x and y ✓ $y = 2^x$	(2)
6.3	$\log_2(3-x) = x$ $2^x = 3-x$ $2^x = -x+3$ Reflect the graph of g about the line $y=x$ to obtain g^{-1} and determine the point of intersection of f and g^{-1} / <i>Reflekteer die grafiek van g om die lyn $y=x$ en bepaal die snypunt van f and g^{-1}</i>	✓ ✓ $2^x = -x+3$ ✓ point of intersection of f and g^{-1}	(3)
6.4	$x = 1$	✓ answer	(1) [10]

KWV 08 MEMO

QUESTION/VRAAG 4

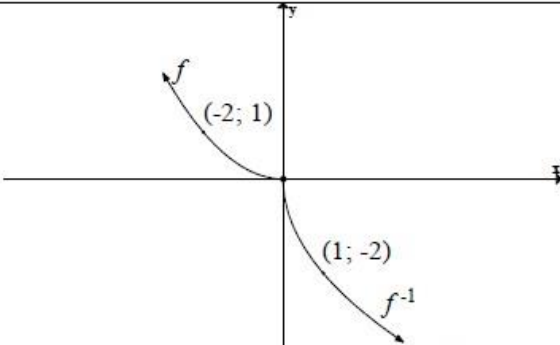
4.1	$(0; 2)$	✓ answer (1)
4.2		✓ shape ✓ $(0; 2)$ ✓ asymptote (3)
4.3	$f(-2) = 5$ $f(1) = 2^{-1} + 1 = \frac{3}{2}$ Average gradient = $\frac{f(1) - f(-2)}{1 - (-2)}$ $= \frac{\frac{3}{2} - 5}{3}$ $= -\frac{7}{6}$	✓ $f(-2) = 5$ ✓ $f(1) = \frac{3}{2}$ ✓ answer (3)
4.4	Since the asymptote of f is $y = 1$, the asymptote of $h(x) = 3f(x)$ will be $y = 3$. <i>Omdat die asimptoot van f $y = 1$ is, sal die asimptoot van $h(x) = 3f(x)$ $y = 3$ wees.</i>	✓ answer (1) [8]

QUESTION/VRAG 5

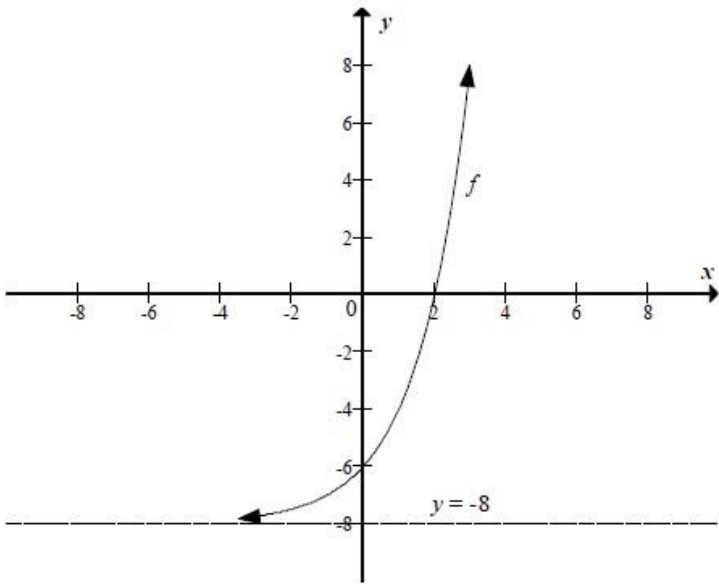
5.1	$y = a(x + p)^2 + q$ Turning point (1 ; -8) : $y = a(x - 1)^2 - 8$ Substitute (0 ; -4) : $-4 = a(0 - 1)^2 - 8$ $-4 = a - 8$ $a = 4 \quad p = -1 \quad q = -8$ $y = 4(x - 1)^2 - 8$	$\checkmark y = a(x - 1)^2 - 8$ $\checkmark$ substitute (0; -4) $\checkmark a = 4$ $\checkmark p$ and q values (4)
5.2	Asymptote is $y = -2 \Rightarrow d = -2$ Substitute (1; -8): $-8 = \frac{k}{1+r} - 2$ $k = -6(1+r)$ $k = -6 - 6r \dots\dots\dots \text{line 1}$ Substitute (0; -4): $-4 = \frac{k}{r} - 2$ $\frac{k}{r} = -2$ $k = -2r \dots\dots\dots \text{line 2}$ Equating lines 1 and 2: $-6 - 6r = -2r$ $-4r = 6$ $r = -\frac{3}{2}$ Substituting into line 2 or line 1: $k = (-2)\left(-\frac{3}{2}\right) = 3 \qquad k = -6 - 6\left(-\frac{3}{2}\right) = 3$	$\checkmark d = -2$ $\checkmark k = -6 - 6r$ $\checkmark k = -2r$ $\checkmark -6 - 6r = -2r$ $\checkmark$ value of r $\checkmark$ value of k (6)
5.3	$g(x) \geq f(x)$ $\therefore 0 \leq x \leq 1$	$\checkmark 0 \leq x$ $\checkmark x \leq 1$ (2)
5.4	The line $y = k$ must pass through f twice on the positive side of the x-axis. / Die lyn $y = k$ moet twee keer deur f aan die positiewe kant van die x-as sny. $-8 < k < -4$	$\checkmark -8 < k$ $\checkmark k < -4$ (2)

5.5	$y = -x + c$ Substitute the intersection point of the asymptotes, i.e. $\left(\frac{3}{2}; -2\right)$: <i>Vervang die snypunt van die asimptote, m.a.w. $\left(\frac{3}{2}; -2\right)$:</i> $-2 = -\frac{3}{2} + c$ $c = -\frac{1}{2}$ $y = -x - \frac{1}{2}$ OR/OF $y = -x$ is translated $\frac{3}{2}$ units right and 2 units down/ $y = -x$ <i>transleer $\frac{3}{2}$ eenhede na regs en 2 eenhede na onder $\Rightarrow$</i> $y = -\left(x - \frac{3}{2}\right) - 2$ $y = -x - \frac{1}{2}$	$\checkmark y = -x + c$ $\checkmark -2 = -\frac{3}{2} + c$ $\checkmark$ answer (3)
5.6	By symmetry, $Q = \left(\frac{3}{2} + 8 - 2; -2 + \frac{3}{2} - 1\right)$ $= \left(\frac{15}{2}; -\frac{3}{2}\right)$	$\checkmark x = \frac{15}{2}$ $\checkmark y = -\frac{3}{2}$ (2) [19]

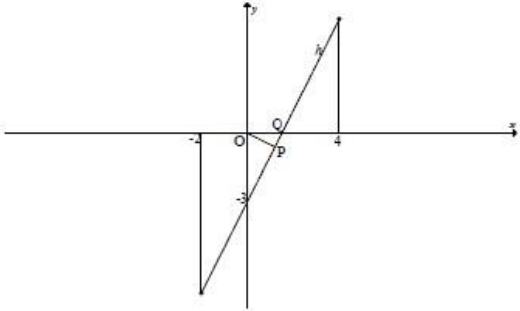
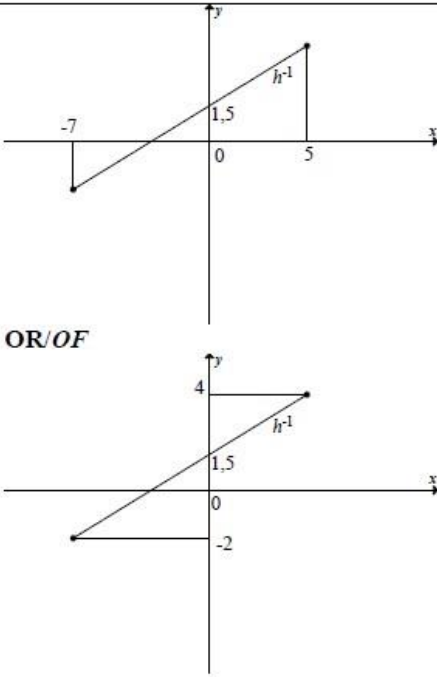
QUESTION/VRAAG 6

6.1	$f: y = \frac{1}{4}x^2$ $f^{-1}: x = \frac{1}{4}y^2$ $y^2 = 4x$ $y = \pm\sqrt{4x}$ $f^{-1}(x) = -\sqrt{4x}$ OR/OF $f^{-1}(x) = -2\sqrt{x}$	✓ interchanging x and y ✓ $y^2 = 4x$ ✓ answer (3)
6.2		✓ both graphs pass through (0 ; 0) ✓ shape for both ✓ one additional point on both graphs (3)
6.3	Yes. No value of x in the domain of f^{-1} maps onto more than one y-value. <i>Ja. Geen waarde van x in die definisieversameling van f^{-1} assosieer met meer as een y-waarde nie.</i> OR/OF Yes. One to one function./Ja. Een-tot-een-funksie. OR/OF Yes. Vertical line test holds./Ja. Die vertikale lyntoets werk.	✓ yes ✓ reason (2) ✓ yes ✓ reason (2) ✓ yes ✓ reason (2) [8]

QUESTION/VRAAG 4

Given: $f(x) = 2^{x+1} - 8$		
4.1	$y = -8$	✓ $y = -8$ (1)
4.2		✓ x-intercept ✓ y-intercept ✓ shape ✓ asymptote (only if the graph does not cut the asymptote) (4)
4.3	$g(x) = 2^{-x+1} - 8$ OR/OF $g(x) = \left(\frac{1}{2}\right)^{x-1} - 8$	✓ answer (1) ✓ answer (1) [6]

QUESTION/VR4AG 5

Given $h(x) = 2x - 3$ for $-2 \leq x \leq 4$. 		
5.1	For x-intercepts, $y = 0$ $2x - 3 = 0$ $x = 1,5$ $Q(1,5 ; 0)$	✓ $x = 1,5$ ✓ $y = 0$ (2)
5.2	h: $x = -2$: $y = 2(-2) - 3 = -7$ $x = 4$: $y = 2(4) - 3 = 5$ Domain of h^{-1}: $-7 \leq x \leq 5$ OR/OF $[-7; 5]$	✓ $h(-2) = -7$ ✓ $h(4) = 5$ ✓ $-7 \leq x \leq 5$ (3)
5.3	 OR/OF	✓ y-intercept on a straight line ✓ line segment ✓ accurate endpoints (x or y or both) (3)

5.5	$OP^2 = (x-0)^2 + (y-0)^2$ $= x^2 + (2x-3)^2$ $= x^2 + 4x^2 - 12x + 9$ $= 5x^2 - 12x + 9$ For OP to be at its minimum, OP^2 has to be a minimum <i>Vir OP om minimum te wees, moet OP^2 'n minimum wees</i> $\frac{d(OP^2)}{dx} = 0 \quad \text{OR / OF} \quad x = -\frac{b}{2a}$ $10x - 12 = 0 \quad \quad \quad = -\frac{-12}{2(5)}$ $\therefore x = \frac{6}{5}$ Minimum length of OP = $\sqrt{5\left(\frac{6}{5}\right)^2 - 12\left(\frac{6}{5}\right) + 9} = \sqrt{\frac{9}{5}}$ or $\frac{3}{\sqrt{5}}$ or 1,34 units OR/OF For minimum distance $OP \perp$ the line $m_h = 2$ (given) $m_{OP} = \frac{-1}{2}$ $\therefore$ OP has equation $y = \frac{-1}{2}x$ $\frac{-1}{2}x = 2x - 3$ $-x = 4x - 6$ $5x = 6$ $x_p = 1,2$ $y_p = -\frac{1}{2}(1,2) = -0,6$ $OP = \sqrt{(1,2-0)^2 + (-0,6-0)^2}$ $= 1,34 \text{ or } \sqrt{1,8} \text{ units}$	$\checkmark OP^2 = x^2 + y^2$ $\checkmark$ substitute $y = 2x - 3$ $\checkmark 5x^2 - 12x + 9$ $\checkmark$ x-value $\checkmark$ answer (5) $\checkmark m_{OP} = \frac{-1}{2}$ $\checkmark$ equation of OP $\checkmark \frac{-1}{2}x = 2x - 3$ $\checkmark$ x-value $\checkmark$ answer (5)
-----	---	---

OR/OF

For minimum distance $OP \perp$ the line

$$O(0;0) \quad P(x; 2x-3) \quad Q\left(\frac{3}{2}; 0\right)$$

$$OP^2 + PQ^2 = OQ^2 \quad (\text{pythag})$$

$$(x-0)^2 + (2x-3-0)^2 + \left(x-\frac{3}{2}\right)^2 + (2x-3-0)^2 = \left(\frac{3}{2}\right)^2$$

$$x^2 + 4x^2 - 12x + 9 + x^2 - 3x + \frac{9}{4} + 4x^2 - 12x + 9 = \frac{9}{4}$$

$$10x^2 - 27x + 18 = 0$$

$$(5x-6)(2x-3) = 0$$

$$x = \frac{6}{5} \text{ or } \frac{3}{2}$$

Hence, $x = \frac{6}{5}$ at P

$$OP^2 = x^2 + (2x-3)^2$$

$$= \left(\frac{6}{5}\right)^2 + \left(2\left(\frac{6}{5}\right) - 3\right)^2$$

$$= \frac{36}{25} + \frac{9}{25}$$

$$= \frac{9}{5}$$

$$OP = 1,34$$

OR/OF

For minimum distance $OP \perp$ the line

$$\tan \hat{Q} = 2$$

$$\hat{Q} = 63,43^\circ$$

$$\sin 63,43^\circ = \frac{OP}{1,5}$$

$$OP = 1,34$$

$$\checkmark OP^2 = x^2 + y^2$$

$$\checkmark \text{substitute} \\ y = 2x - 3$$

$\checkmark$

$$10x^2 - 27x + 18$$

$\checkmark$ x-value

$\checkmark$ answer

(5)

$$\checkmark \tan \hat{Q} = 2$$

$$\checkmark \hat{Q} = 63,43^\circ$$

$$\checkmark \sin 63,43^\circ$$

$$\checkmark \frac{OP}{1,5}$$

$\checkmark$ answer

(5)

OR/OF

$$\begin{aligned} OP &= \sqrt{(x-0)^2 + (y-0)^2} \\ &= \sqrt{(x-0)^2 + (2x-3-0)^2} \\ &= \sqrt{x^2 + 4x^2 - 12x + 9} \\ &= \sqrt{5x^2 - 12x + 9} \end{aligned}$$

By using the chain rule (which is not in the CAPS):

$$\frac{dOP}{dx} = \frac{1}{2}(5x^2 - 12x + 9)^{-\frac{1}{2}} \cdot (10x - 12)$$

$$0 = \frac{1}{2}(5x^2 - 12x + 9)^{-\frac{1}{2}} \cdot (10x - 12)$$

$$0 = \frac{1}{2}(10x - 12)$$

$$0 = 5x - 6$$

$$x = \frac{6}{5}$$

$$OP = \sqrt{5\left(\frac{5}{6}\right)^2 - 12\left(\frac{6}{5}\right) + 9}$$
$$= 1,34$$

✓

$$OP = \sqrt{(x-0)^2 + (y-0)^2}$$

✓ substitute
 $y = 2x - 3$

$\checkmark 5x^2 - 12x + 9$

OR/OF

For minimum distance $OP \perp$ the line

Let the y -intercept be R

OR = 3 units

$$OQ = \frac{3}{2} \text{ units}$$

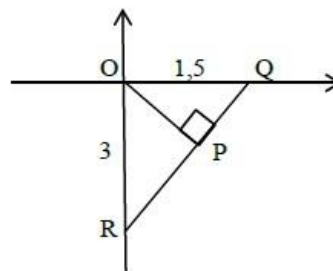
$$RQ = \frac{3}{2}\sqrt{5} \quad (\text{Pythagoras})$$

$$\text{Area OQR} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$\frac{1}{2} \cdot OR \cdot OQ = \frac{1}{2} \cdot \left(\frac{3}{2} \sqrt{5} \right) \cdot OP$$

$$\frac{1}{2} \cdot 3 \cdot \left(\frac{3}{2}\right) = \frac{1}{2} \cdot \left(\frac{3}{2} \sqrt{5}\right) \cdot OP$$

$$OP = \frac{3}{\sqrt{5}} = 1,34$$



✓ x-value

✓ answer

(5)

$$\checkmark RQ = \frac{3}{2}\sqrt{5}$$

$$\checkmark \frac{1}{2} \left(\frac{3}{2} \sqrt{5} \right) \cdot \text{OP}$$

$$\checkmark \frac{1}{2} \cdot 3 \cdot \left(\frac{3}{2}\right)$$

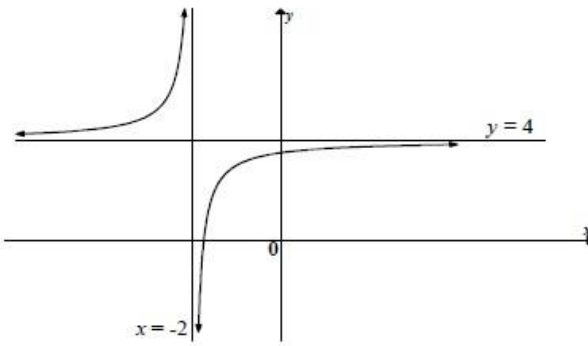
✓ equating

✓ answer

(5)

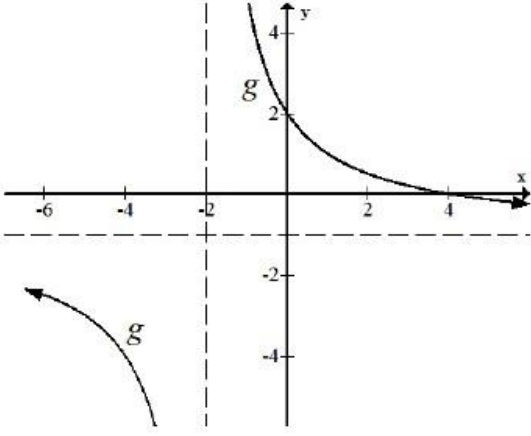
5.6.1	$f'(x) = 2x - 3$ Turning point at $x = \frac{3}{2}$ $f''(x) = 2 > 0$ or $f''\left(\frac{3}{2}\right) > 0$ f has a local minimum at $x = \frac{3}{2}$ <i>f het 'n lokale minimum by $x = \frac{3}{2}$</i> OR/OF $h(x) = f'(x) < 0$ for $x \in (-2 ; 1,5) \Rightarrow f$ is decreasing on the left of Q / <i>f is dalend links van Q.</i> $h(x) = f'(x) > 0$ for $x \in (1,5 ; 4) \Rightarrow f$ is increasing on the right of Q / <i>f is stygend regs van Q.</i> $\therefore f(x)$ has a local minimum when $x = \frac{3}{2}$ / $\therefore f(x)$ het 'n lokaal minimum by $x = \frac{3}{2}$ OR/OF $f(x) = x^2 - 3x + c$ f has a minimum value since $a > 0$ <i>f het 'n minimum waarde omdat $a > 0$</i>	✓ Turning point at $x = \frac{3}{2}$ ✓ $f''(x) = 2 > 0$ (2) ✓ decreasing left of Q ✓ increasing right of Q (2) ✓ $f(x) = x^2 - 3x + c$ ✓ explanation (2)
5.6.2	$m = f'(4) = h(4) = 5$	✓ answer (1) [19]

QUESTION/VRAAG 6

6.1.1	$T(0;18)$	✓ (0;18) (1)
6.1.2	$-2x^2 + 18 = 0$ $(x-3)(x+3) = 0$ $Q(3;0)$ OR/OF $-2x^2 + 18 = 0$ $x^2 = 9$ $Q(3;0)$	✓ $y=0$ ✓ factors ✓ $x=3$ (3) ✓ $y=0$ ✓ $x^2=9$ ✓ $x=3$ (3)
6.1.3	x -coordinate of S is 4,5/ x -koördinaat van S is 4,5 By symmetry about the line $x = 4,5$ /Deur simmetrie om die lyn $x = 4,5$: $R = (4,5 + 4,5 - 3; 0) = (6; 0)$	✓ $x=6$ ✓ $y=0$ (2)
6.1.4	For all $x \in \mathbf{R}$ OR/OF $(-\infty; \infty)$	✓✓ answer (2)
6.2	If $C(x; y)$ is the centre of the hyperbola/As $C(x; y)$ die middelpunt is van die hiperbool $y = x + 6$ and $x = -2$ $\therefore y = -2 + 6 = 4$ 	✓✓ asymptote $y = 4$ ✓ asymptote $x = -2$ ✓ shape (increasing hyperbolic function) (4) [12]

KWV 10 MEMO

QUESTION/VRAG 4

4.1	$x = -2$ $y = -1$	✓ $x = -2$ ✓ $y = -1$ (2)
4.2.1	$g(0) = \frac{6}{0+2} - 1$ $= 2$ y-intercept/afsnit (0 ; 2)	✓ answer/antwoord (1)
4.2.2	$0 = \frac{6}{x+2} - 1$ $1 = \frac{6}{x+2}$ $x+2 = 6$ $x = 4$ x-intercept/afsnit (4 ; 0)	✓ equating to/stel gelyk aan 0 ✓ answer/antwoord (2)
4.3		✓ asymptotes/asimptote ✓ intercepts/afsnitte ✓ shape/vorm (3)
4.4	$y + 1 = -(x + 2)$ $y = -x - 3$ OR/OF Using general formula/Gebruik algemene formule: $y = -(x + p) + q$ $y = -(x + 2) - 1$ $y = -x - 3$	✓ $m = -1$ ✓ substitution of (-2 ; -1) ✓ answer (3) ✓ formula/formule ✓ substitution of p and q values/substitusie van p- en q-waardes ✓ answer/antwoord (3)
4.5	$x > -2$	✓✓ answer (2)

[13]

QUESTION/VRAAG 5

5.1	$9 = a^2$ $a = 3$ OR/OF $f^{-1}(x) = \log_a x$ $2 = \log_a 9$ $a^2 = 9 = 3^2$ $\therefore a = 3$	$\checkmark 9 = a^2$ $\checkmark a = 3$ (2) $\checkmark 9 = a^2$ $\checkmark a = 3$ (2)
5.2	$g(x) = 3^{-x}$ OR/OF $g(x) = \left(\frac{1}{3}\right)^x$	$\checkmark$ answer/antwoord (1) $\checkmark$ answer/antwoord (1)
5.3	$x \geq 9$ OR/OF $f^{-1}(x) = \log_3 x$ $\log_3 x = 2$ $x = 3^2 = 9$ $\therefore x \geq 9$ OR/OF $\log_3 x \geq 2$ $x \geq 3^2$ $\therefore x \geq 9$	$\checkmark \checkmark$ answer/antwoord (2) $\checkmark \checkmark$ answer/antwoord (2) $\checkmark \checkmark$ answer/antwoord (2)
5.4	Yes/Ja. For every y-value there is only one x such that/Vir elke y-waarde is daar slegs een x sodanig dat $y = f(x)$. OR/OF Yes/Ja. f is a one-to-one relation/is 'n een-tot-een-relasie.	$\checkmark$ Yes/Ja $\checkmark$ Reason/Rede (2) $\checkmark$ Yes/Ja $\checkmark$ Reason/Rede (2) [7]

QUESTION/VRAAG 6

6.1	$-3 \leq x \leq 2$	✓ critical values/ <i>kritiese waardes</i> ✓ notation/notasie (2)
6.2	$f: y = a(x - x_1)(x - x_2)$ $y = a(x + 3)(x - 2)$ $-8 = a(1 + 3)(1 - 2)$ $-8 = -4a$ $2 = a$ $y = 2(x + 3)(x - 2)$ $y = 2x^2 + 2x - 12$ $b = 2$ and/en $c = -12$ OR/OF $y = a\left(x + \frac{1}{2}\right)^2 + q$ $0 = a\left(2 + \frac{1}{2}\right)^2 + q \rightarrow 0 = \frac{25}{4}a + q \dots(1)$ $-8 = a\left(1 + \frac{1}{2}\right)^2 + q \rightarrow -8 = \frac{9}{4}a + q \dots(2)$ $(1) - (2): 8 = 4a$ $a = 2$ $q = 0 - \frac{25}{4}(2) = -\frac{25}{2} = -12,5$ $y = 2\left(x + \frac{1}{2}\right)^2 - 12\frac{1}{2}$ $y = 2\left(x^2 + x + \frac{1}{4}\right) - 12\frac{1}{2}$ $y = 2x^2 + 2x + \frac{1}{2} - 12\frac{1}{2}$ $y = 2x^2 + 2x - 12$ $\therefore b = 2$ and $c = -12$ OR/OF	✓ $y = a(x + 3)(x - 2)$ ✓ substitute/vervang (1 ; -8) ✓ $a = 2$ ✓ $b = 2$ and/en ✓ $c = -12$ (5) ✓ equation/vergelyking 1 ✓ equation/vergelyking 2 ✓ $a = 2$ ✓ substitution/substitusie ✓ $b = 2$ and/en ✓ $c = -12$ (5)

	$y = 2[x^2 + x - 6]$ $y = 2\left[x^2 + x + \left(\frac{1}{2} \cdot 1\right)^2 - 6 - \left(\frac{1}{2} \cdot 1\right)^2\right]$ $= 2\left[\left(x + \frac{1}{2}\right)^2 - 6,25\right]$ $= 2\left(x + \frac{1}{2}\right)^2 - 12,5$ $\text{TP}\left(-\frac{1}{2}; -12,5\right)$ OR/OF $x = \frac{-3 + 2}{2} = -\frac{1}{2}$ $y = 2\left(-\frac{1}{2}\right) + 2\left(-\frac{1}{2}\right) - 12$ $y = -12\frac{1}{2}$ $\text{TP}\left(-\frac{1}{2}; -12,5\right)$ OR/OF $f(x) = y = 2x^2 + 2x - 12$ $f'(x) = 4x + 2$ $4x + 2 = 0$ $4x = -2$ $x = -\frac{1}{2}$ $\therefore y = 2\left(-\frac{1}{2}\right)^2 + 2\left(-\frac{1}{2}\right) - 12 = -\frac{25}{2}$ $\text{TP}\left(-\frac{1}{2}; -\frac{25}{2}\right)$	✓ method/<i>metode</i> ✓ x-value/<i>waarde</i> ✓ y-value/<i>waarde</i> (3) ✓ method/<i>metode</i> ✓ x-value/<i>waarde</i> ✓ y-value/<i>waarde</i> (3) ✓ method/<i>metode</i> ✓ x-value/<i>waarde</i> ✓ y-value/<i>waarde</i> (3)
6.4	$x = \frac{13}{2}$	✓✓ answer/<i>i</i> (2)
6.5	$f'(x) = 4x + 2$ $m = f'(1) = 4(1) + 2$ $m = 6$	✓ $y' = 4x + 2$ ✓ subst. $x = 1$ ✓ answer/<i>antwoord</i> (3) [15]

KWV 11 MEMO

QUESTION/VRAG 4

4.1	$p = 1$ $q = 1$	$\checkmark p$ value /waarde $\checkmark q$ value /waarde (2)
4.2	$0 = \frac{2}{x+1} + 1$ $-x - 1 = 2$ $x = -3$ OR/OF Reflect (0 ; 3) across $y = -x$ to get T(-3 ; 0) $x = -3$ Reflekteer (0 ; 3) om $y = -1$ om T(-3 ; 0) te kry $x = -3$	$\checkmark 0 = \frac{2}{x+1} + 1$ $\checkmark x = -3$ (2) $\checkmark$ reflect across/reflekteer om $y = -x$ $\checkmark x = -3$ (2)
4.3	Shifting g five units to the left shifts (-1 ; 0) five units to the left. $x = -6$	$\checkmark$ answer/antwoord (1)
4.4	$\frac{2}{x+1} + 1 = x$ $2 + x + 1 = x^2 + x$ $x^2 = 3$ $\therefore x = \sqrt{3}$ since at S, $x > 0$ $y = \sqrt{3} = 1,73...$ $OS^2 = x^2 + y^2 = 3 + 3 = 6$ $\therefore OS = \sqrt{6} = 2,45$ units/eenhede OR/OF	$\checkmark$ equating both graphs/stel grafieke gelyk $\checkmark x^2 = 3$ $\checkmark x = \sqrt{3}$ and $y = \sqrt{3}$ $\checkmark OS^2 = 6$ $\checkmark$ answer/antwoord (5)

	Translate g one unit down and one unit to the right/Transleer g een eenheid af en een eenheid na regs The new equation/Die nuwe vergelyking : $p(x) = \frac{2}{x}$ Therefore the image of S is $S'(\sqrt{2}; \sqrt{2})$ / Daarom is die beeld van S nou $S'(\sqrt{2}; \sqrt{2})$ Now translate p back to g/Transleer p terug na g: $S(\sqrt{2} - 1; \sqrt{2} + 1)$ $OS^2 = (\sqrt{2} - 1)^2 + (\sqrt{2} + 1)^2 = 2 - 2\sqrt{2} + 1 + 2 + 2\sqrt{2} + 1$ $\therefore OS = \sqrt{6} = 2,45$ units/eenhede	$\checkmark p(x) = \frac{2}{x}$ $\checkmark \checkmark$ coord. of/koörd. van S' $\checkmark$ coord. of/koörd. van S $\checkmark$ answer/antwoord (5)
4.5	$k < 3$ will give roots with opposite signs/ $k < 3$ sal wortels met teenoorgestelde tekens gee	$\checkmark k < 3$ (1)

[11]

QUESTION 5

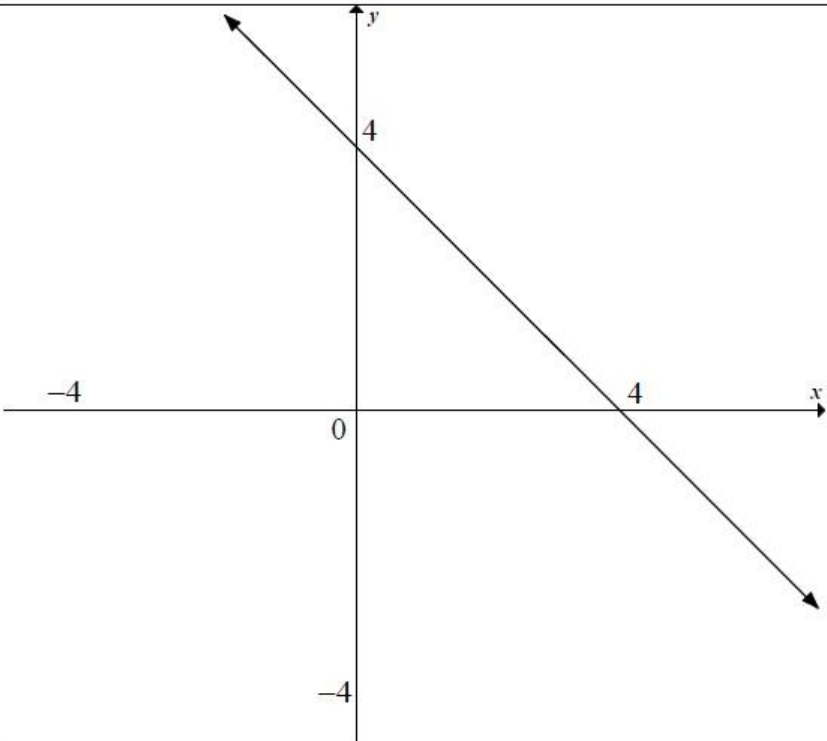
5.1	$y = \log_a x$ $-1 = \log_a \frac{1}{3}$ $a^{-1} = \frac{1}{3}$ $a = \left(\frac{1}{3}\right)^{-1}$ $\therefore a = 3$	$\checkmark$ subst. $\left(\frac{1}{3}; -1\right)$ $\checkmark a^{-1} = \frac{1}{3}$ or $a = \left(\frac{1}{3}\right)^{-1}$ (2)
5.2	$h: x = \log_3 y$ $\therefore y = 3^x$	$\checkmark$ swop x and y/ruil x en y $\checkmark$ answer/antwoord (2)
5.3	$g(x) = -\log_3 x$ OR/OF $g(x) = \log_3 \frac{1}{x}$ OR/OF $g(x) = \log_{\frac{1}{3}} x$ OR/OF $x = 3^{-y}$ OR/OF $x = \left(\frac{1}{3}\right)^y$	$\checkmark$ answer/antwoord (1) $\checkmark$ answer/antwoord (1) $\checkmark$ answer/antwoord (1) $\checkmark$ answer/antwoord (1) $\checkmark$ answer/antwoord (1)
5.4	$x > 0$ OR/OF $(0; \infty)$	$\checkmark$ answer/antwoord (1) $\checkmark$ answer/antwoord (1)
5.5	$\log_3 x = -3$ $x = 3^{-3}$ $x = \frac{1}{27}$ $x \geq \frac{1}{27}$	$\checkmark$ exponential form/ eksponensiële vorm $\checkmark$ simplification/vereenvoudiging $\checkmark$ answer/antwoord (3) [9]

QUESTION/VRAG 6

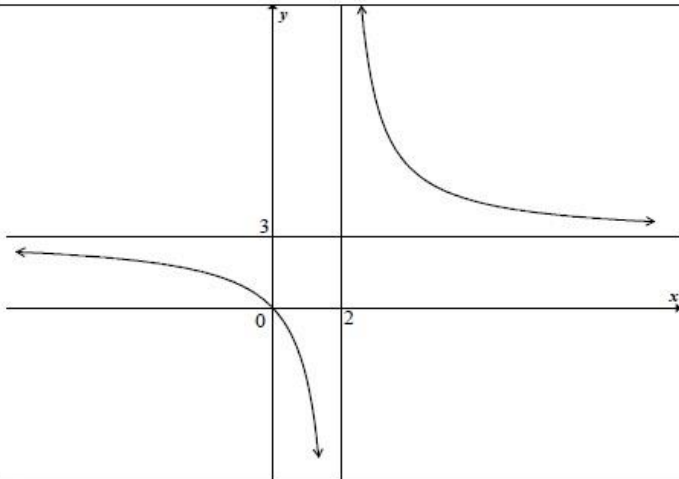
6.1	$4x^2 - 6 = 0$ $x^2 = \frac{3}{2}$ $x = 1,22$ (x - coordinate of S is positive)	$\checkmark y = 0$ $\checkmark 1,22$ (2)
6.2	(0 ; -6)	$\checkmark 0$ $\checkmark -6$ (2)
6.3.1	$QT = f(x) - g(x)$ $= 2\sqrt{x} - (4x^2 - 6)$ or $= 2\sqrt{x} - 4x^2 + 6$	$\checkmark \checkmark$ correct formula/ <i>korrekte formule</i> $\checkmark$ substitution/substitusie (3)
6.3.2	$QT = 2x^{\frac{1}{2}} - 4x^2 + 6$ Deravitive of $QT = x^{\frac{-1}{2}} - 8x = 0$ $\frac{1}{\sqrt{x}} = 8x$ $x^{\frac{3}{2}} = \frac{1}{8}$ or $\frac{1}{x} = 64x^2$ $x = \left(\frac{1}{8}\right)^{\frac{2}{3}}$ $x = \left(\frac{1}{2}\right)^2$ or $x^3 = \frac{1}{64}$ $x = \frac{1}{4} = 0,25$ $\text{Max/Maks } QT = 2\left(\frac{1}{4}\right)^{\frac{1}{2}} - 4\left(\frac{1}{4}\right)^2 + 6$ $= 6\frac{3}{4} = 6,75 \text{ units/eenhede}$	$\checkmark$ derivative/afgeleide $\checkmark$ derivative equal to 0/ <i>afgeleide gelyk aan 0</i> $\checkmark x^{\frac{3}{2}} = \frac{1}{8}$ $\checkmark$ x-value/x-waarde $\checkmark$ substitution/substitusie $\checkmark$ answer/antwoord (6) [13]

KWV 12 MEMO

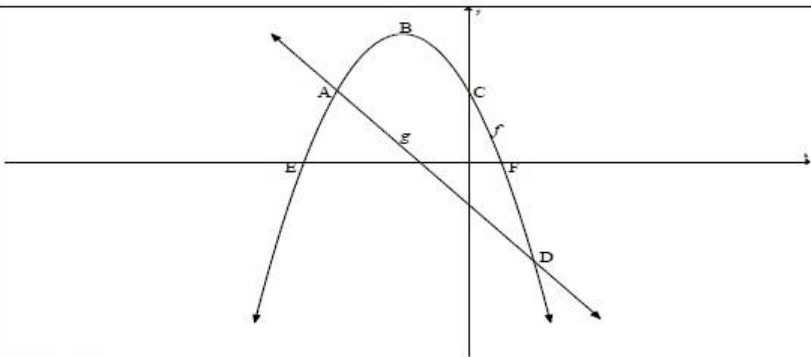
QUESTION/VRAAG 5

5.1		✓ x-intercept of straight line ✓ y-intercept of straight line ✓✓ circle (4)
5.2	Points of intersection are (0 ; 4) and (4 ; 0)	✓ (0 ; 4) ✓ (4 ; 0) (2) [6]

QUESTION/VR4AG 6

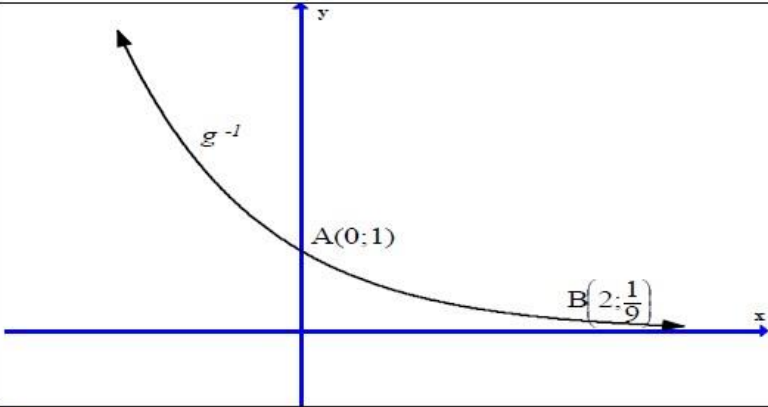
6.1	$x = 2$ $y = 3$	$\checkmark x = 2$ $\checkmark y = 3$ (2)
6.2	R : $x \neq 2$ OR $(-\infty ; 2) \cup (2 ; \infty)$ OR $\mathbf{R} - \{2\}$	$\checkmark$ answer (1)
6.3		$\checkmark$ shape $\checkmark$ intercept at origin $\checkmark$ asymptotes (4)
6.4	$y = x + 3$ and $y = -x + 1$ $x + 3 = -x + 1$ $2x = -2$ $x = -1$ $y = -1 + 3$ $= 2$ Point of intersection of asymptotes: $(-1 ; 2)$ <i>Die snypunt van die asimptote:</i> The transformation is a translation 3 units left and 1 unit down <i>Die transformasie is 'n translasie van 3 eenhede na links en 1 eenheid na onder</i> OR The transformation is $(x ; y) \rightarrow (x - 3 ; y - 1)$	$\checkmark x + 3 = -x + 1$ $\checkmark x = -1$ $\checkmark y = 2$ $\checkmark$ transformation (4) [11]

QUESTION/VRAAG 7

7.1	 $C(0; 5)$	✓ $C(0; 5)$ (1)
7.2	$x = \frac{-4 + 0}{2}$ $= -2$	✓ $\frac{-4 + 0}{2}$ (1)
7.3	$p = -2$ $y = a(x + 2)^2 + q$ $5 = a(0 + 2)^2 + q$ $5 = 4a + q$ $0 = a(1 + 2)^2 + q$ $0 = 9a + q$ $5a = -5$ $a = -1$ $q = 9$ $f(x) = -(x + 2)^2 + 9$ OR $p = -2$ $f(x) = a(x - 1)(x + 5)$ $5 = a(-1)(5)$ $a = -1$ $q = f(-2)$ $= -1(-3)(3)$ $= 9$	✓ $p = -2$ ✓ $5 = 4a + q$ ✓ $0 = 9a + q$ ✓ simultaneous equation ✓ $a = -1$ ✓ $q = 9$ (6) ✓ $p = -2$ ✓ $f(x) = a(x - 1)(x + 5)$ ✓ substitution ✓ $a = -1$ ✓ substitution ✓ $q = 9$ (6)
7.4	$-x^2 - 4x + 5 = -2x - 3$ $x^2 + 2x - 8 = 0$ $(x + 4)(x - 2) = 0$ $x = -4 \quad \text{or} \quad x = 2$ ∴ x - coordinate of D is 2	✓ equating ✓ standard form ✓ factors ✓ 2 (4)

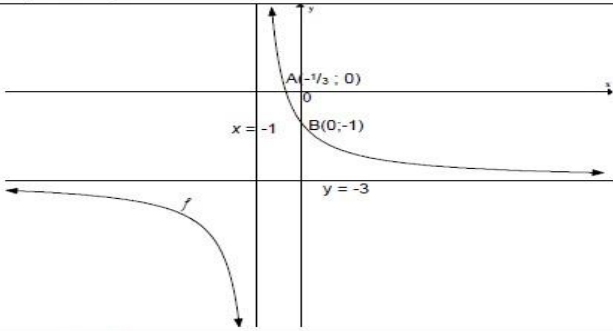
7.5	$(-2 ; -9)$	$\checkmark 2$ $\checkmark -9$ (2) [14]
-----	-------------	---

QUESTION/VR4AG 8

8.1	$A(1; 0)$	$\checkmark$ answer (1)
8.2		$\checkmark$ shape $\checkmark A(0 ; 1)$ $\checkmark B\left(2;\frac{1}{2}\right)$ (3)
8.3	R	$\checkmark$ answer (1) [5]

KWV 13 MEMO

QUESTION/VRAAG 4

4.1.1	$f(x) = \frac{2}{x+1} - 3$ $y = f(0)$ $= \frac{2}{0+1} - 3$ $= -1$ $(0; -1)$	✓ subst $x = 0$ ✓ $(0; -1)$ (2)
4.1.2	$0 = \frac{2}{x+1} - 3$ $3 = \frac{2}{x+1}$ $3x + 3 = 2$ $x = -\frac{1}{3}$ $\left(-\frac{1}{3}; 0\right)$	✓ subs $y = 0$ ✓ $\left(-\frac{1}{3}; 0\right)$ (2)
4.1.3		✓ shape ✓ both intercepts correct ✓ horizontal and vertical asymptote (3)
4.1.4	$y = -(x+1) - 3$ $y = -x - 4$ OR $y = -x + k$ $-3 = -(-1) + k$ $k = -4$ $y = -x - 4$	✓ $y = -(x+1) - 3$ ✓ $y = -x - 4$ (2) ✓ $-3 = -(-1) + k$ ✓ $y = -x - 4$ (2)
4.2.1	$y = a.b^x + q$ $y = a.b^x - 3$ $-2 = a.b^0 - 3 \quad [\text{subs } (0; -2)]$ $a = 1$ $y = 1.b^x - 3 \quad [\text{subs } (1; -1)]$ $-1 = b^1 - 3$ $b = 2$ $f(x) = 2^x - 3$	✓ subs $q = -3$ ✓ $a = 1$ ✓ $b = 2$ ✓ $f(x) = 2^x - 3$ (4)
4.2.2	A translation of 4 units up and 1 unit to the left. <i>'n Translasie van 4 eenhede na bo en 1 eenheid na links.</i> OR Dilation by a factor of 2 and 7 units up. <i>Verkleining deur faktor van 2 en 7 eenhede na bo.</i>	✓ 4 units up ✓ 1 unit to the left (2) ✓ dilation by factor 2 ✓ 7 units up (2) [15]

QUESTION/VRAAG 5

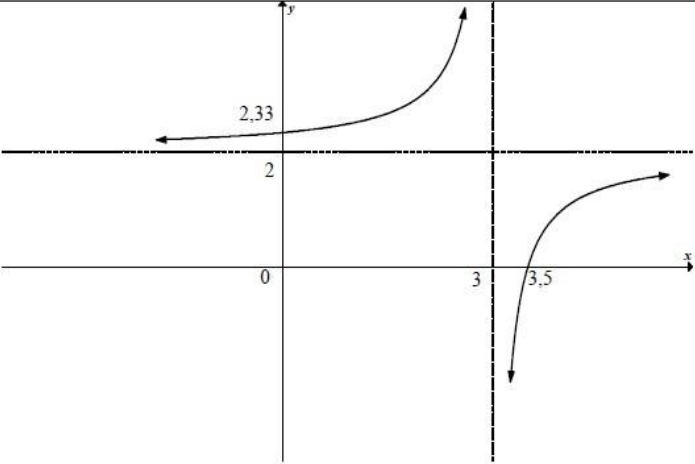
5.1	$f(x) = -2x^2 - 5x + 3$ $x = -\frac{b}{2a}$ or $f'(x) = 0$ $x = -\left(\frac{-5}{2(-2)}\right)$ $-4x - 5 = 0$ $x = -\frac{5}{4}$ $x = -\frac{5}{4}$ $y = -2\left(-\frac{5}{4}\right)^2 - 5\left(-\frac{5}{4}\right) + 3$ $= \frac{49}{8} \quad / \quad 6,125$ TP $\left(-\frac{5}{4}; \frac{49}{8}\right)$ OR $y = -2\left(x^2 + \frac{5}{2}x - \frac{3}{2}\right)$ $= -2\left[\left(x + \frac{5}{4}\right)^2 - \frac{25}{16} - \frac{3}{2}\right]$ TP $\left(-\frac{5}{4}; \frac{49}{8}\right)$ $= -2\left[\left(x + \frac{5}{4}\right)^2 - \frac{49}{16}\right]$ $= -2\left(x + \frac{5}{4}\right)^2 + \frac{49}{8}$	$\checkmark x = -\frac{b}{2a} \quad / \quad f'(x) = 0$ $\checkmark x = -\frac{5}{4}$ $\checkmark y = \frac{49}{8} \quad / \quad 6,125$ (3)
5.2	$m_{\text{tangent}} = \tan 135^\circ$ $= -1$ $-4x - 5 = -1$ $-4x = 4$ $x = -1$ $y = -2(-1)^2 - 5(-1) + 3$ $= 6$ Point of contact: P(-1; 6)	$\checkmark \tan 135^\circ = -1$ $\checkmark -4x - 5 = -1$ $\checkmark x = -1$ $\checkmark y = 6$ (4)
5.3	Eq of g: $y - y_1 = m(x - x_1)$ $y - 6 = -1(x + 1)$ $y = -x + 5$	$\checkmark$ substitute in equation $\checkmark$ answer (2)
5.4	$d > 5$	$\checkmark$ answer (1)
		[10]

QUESTION/VRAAG 6

6.1	$g(x) = \sqrt{ax}$ $4 = \sqrt{a(8)}$ $8a = 16$ $a = 2$	✓ subst (8 ; 4) ✓ $a = 2$ (2)
6.2	$x \geq 0$	✓ answer (1)
6.3	$y \geq 0$	✓ answer (1)
6.4	$y = \sqrt{2x} ; x \geq 0$ $x^2 = 2y$ $y = \frac{x^2}{2} ; y \geq 0$	✓ interchange x and y ✓ answer (2)
6.5	$\sqrt{2x} = x - 4$ $2x = x^2 - 8x + 16$ $0 = x^2 - 10x + 16$ $0 = (x - 8)(x - 2)$ $x = 8$ or $x = 2$ when $x = 2$, LHS = 2 but RHS = -2 Hence $x = 8$ only	✓ $2x = x^2 - 8x + 16$ (squaring both sides) ✓ factors ✓ $x = 8$ or $x = 2$ ✓ selects $x = 8$ (4)
6.6	$0 < x < 8$	✓ $x < 8$ ✓ $0 < x$ (2) [12]

KWV 14

QUESTION/VRAAG 5

5.1	$x = 3$ $y = 2$	$\checkmark x = 3$ $\checkmark y = 2$ (2)
5.2	$x \in \mathbb{R}, x \neq 3$ OR/OF $x \in (-\infty ; 3) \cup (3 ; \infty)$ OR/OF $x < 3$ or $x > 3$	$\checkmark$ answer (1) OR/OF $\checkmark$ answer (1) OR/OF $\checkmark$ answer (1)
5.3	$0 = \frac{-1}{x-3} + 2$ $-2x + 6 = -1$ $x = \frac{7}{2}$ x-int: $\left(\frac{7}{2} ; 0\right)$	$\checkmark y = 0$ $\checkmark$ answer (2)
5.4	y-int: $\left(0 ; \frac{7}{3}\right)$	$\checkmark x = 0$ $\checkmark \frac{7}{3}$ (2)
5.5		$\checkmark$ asymptotes $\checkmark$ intercepts with the axes $\checkmark$ shape (3)
		[10]

QUESTION/VRAAG 6

6.1	$f(x) = \log_4 x$ $2 = \log_4 k$ $4^2 = k$ $\therefore k = 16$	✓ substitution of $(k; 2)$ ✓ answer (2)
6.2	$-1 = \log_4 x \quad \therefore x = \frac{1}{4}$ $\frac{1}{4} \leq x \leq 16 \quad \text{or/of} \quad x \in \left[\frac{1}{4}; 16 \right]$	✓ $x = \frac{1}{4}$ ✓ answer (2)
6.3	$f(x) = \log_4 x$ $y = \log_4 x$ $x = \log_4 y$ $y = 4^x$	✓ swapping x and y ✓ answer (2)
6.4	$x < 0$ OR/OF $x \in (-\infty; 0)$	✓✓ answer (2) OR/OF ✓✓ answer (2)
		[8]

QUESTION 7

7.1	B(-4 ; 0) D(6 ; 0)	✓ B(-4 ; 0) ✓ D(6 ; 0) (2)
7.2	$f(x) = x^2 - 2x - 24$ $x_{tp} = \frac{-b}{2a}$ OR/OF $2x - 2 = 0$ OR/OF $x = \frac{-4+6}{2}$ $x = \frac{-(-2)}{2(1)}$ $\therefore x_{tp} = 1$ $y_{tp} = f(1)$ $= 1^2 - 2(1) - 24$ $= -25$ C(1 ; -25)	✓ $x_{tp} = 1$ ✓ $y_{tp} = -25$ (2)
7.3	$y \geq -25$ OR/OF $y \in [-25 ; \infty)$	✓ answer (1) OR/OF ✓ answer (1)
7.4.1	$m_{AE} = \tan 14,04^\circ = 0,25 = \frac{1}{4}$	✓ answer (1)
7.4.2	$m_{\text{tang}} = -4$ $f'(x) = 2x - 2$ $2x - 2 = -4$ $x_T = -1$ $y_T = -21$	✓ $m_{\text{tang}} = -4$ ✓ $f'(x) = 2x - 2$ ✓ equating ✓ $x_T = -1$ ✓ $y_T = -21$ (5)
7.5	$m_{\text{line}} = \frac{1}{4}$ $y + 9 = \frac{1}{4}(x + 3)$ OR/OF $-9 = \frac{1}{4}(-3) + c$ $y + 9 = \frac{1}{4}x + \frac{3}{4}$ $c = -\frac{33}{4} = -8,25$ $y = \frac{1}{4}x - \frac{33}{4}$ OR/OF $y = 0,25x - 8,25$ $x^2 - 2x - 24 = \frac{1}{4}x - \frac{33}{4}$ $4x^2 - 8x - 96 = x - 33$ $4x^2 - 9x - 63 = 0$ $(4x - 21)(x + 3) = 0$ $\therefore x = \frac{21}{4} = 5,25$ or $x \neq -3$	✓ $m_{\text{line}} = \frac{1}{4}$ ✓ substitution m and $K(-3 ; -9)$ ✓ $y = \frac{1}{4}x - \frac{33}{4}$ ✓ equating ✓ standard form ✓ answer with selection (6)
		[17]

WHERE TO START MATHS AND SCIENCE TUTORING

Our vision is to create a majority of learners who will master Maths and Science around the country

TO: EDUCATORS & LEARNERS

JOIN US ON WHATSAP GROUP: 082 672 7928

WE CONDUCT THE FOLLOWING PROGRAMS

⇒ WTS VISITING SCHOOL PROGRAM

DAYS	FRIDAYS, SATURDAYS & SUNDAYS
SUBJECTS	MATHS, MATHS LIT , PHYSCS AND CCOUNTING
TIME	FULL DAYS INCLUDING CROSSNIGHTS



AREAS.....

- ♦ RICHARDS BAY
- ♦ MTUBATUBA
- ♦ STANGER
- ♦ EMPANGENI
- ♦ ESKHAWINI
- ♦ DURBAN
- ♦ PIETERMARITZBURG
- ♦ NEWCASTLE



GRADES : 8 — 12

WTS TUTORING PROGRAMS

⇒ ONE ON ONE LESSONS



Call Now to book your One on One Lesson....

⇒ WTS SATURDAY & SUNDAYS CROSS DAYS CLASSES

LEARNERS FROM DIFFERENT SCHOOLS ARE WELCOME.

TIME	08:00 TO 16:00
SUBJECTS	MATHS & SCIENCES
VENUE	RICHARDS BAY CENTER
DAYS	SATURDAYS AND SUNDAYS



⇒ WTS FINISHING / UPGRADING SESSIONS



PLACE	RICHARDS BAY CENTER
SUBJECTS	MATHS AND PHYSICAL SCIENCES
TIME	18:00 TO 22:00

ACCOMMODATION IS AVAILABLE!!!

⇒ WEEKEND CLASSES/ 3 DAYS CLASSES

PLACE	RICHARDS BAY CENTER
SUBJECTS	MATHS , MATHS LIT, ACCOUNTING AND PHYSICAL SCIENCES
TIME	18:00 TO 22:00

ACCOMMODATION IS AVAILABLE!!!

⇒ PER TERM PROGRAMS

**WTS
CROSSNIGHTS**

**WTS TUTORING
CAMPS**

EVERY TERM: 4 TIMES A YEAR

WHERE TO START MATHS & SCIENCE

WTS tutoring is a South African non-profit organization, founded in 2011. Through WTS Tutoring we develop and distribute high quality curriculum aligned educational resources for Grade 9 – 12. We make these materials available via the social platforms: Facebook, WhatsApp and Telegram), the app WTS Tutors on App Stores and books.

At WTS Tutors we are committed to helping South African learners master maths and science. This is why WTS Tutors aim to:

- Ensure that not a single learner enrolled on our programmes fails Maths & Science.
- Change attitude of learners from fearing and failing Maths & Science to loving and mastering it.
- Expand our reach through Virtual Classes, Mobile Apps and other online platforms.
- Create a leading nation in Maths and Science by transforming the teaching approach.

WTS Tutors offers specific exam revision support. Every year we run Maths and Science Camps to help you ace your exams.

About us

“26,000 learners from all over South Africa across all platforms participate in our programmes”

Dr. KW Sibiya established WTS Tutors to help transform the Maths and Science subjects. After witnessing learners difficulties with the two subjects, he came up with a fun strategy to teach both Maths and Science. He infused learner’s social interests and social trends to illustrate formulas. This approach has proved to be a huge success since learners find it relatable, fun and easy to understand.

Dr. KW. Sibiya

Dr. Sibiya is a Globally Award winning educator. His work has received recognition both locally and internationally:

- 2019 Global Teachers Award in India
- 2019 Global Education Award in Dubai
- 2018 Edu-week Inspirational Award Winner
- 2017 SA Man of the Year Award in Education

Dr. Sibiya is an achiever of excellence and a dedicated educator who leads a team of well trained Tutors who are following on his footsteps. The team of WTS Tutors have also won their first award:

- 2020 Next Billionaire Education Award

Invite us

WTS Tutors are easily accessible via invitation by school groups, teachers or community members from anywhere around South Africa.

Remember that exam preparation also requires motivation and discipline, so try to stay positive, even when the work appears to be difficult. Every little bit of studying, revision and exam practice will pay off. You might benefit from working with a friend or a small study group as long as everyone is as committed as you are. WTS Tutors believes that WTS Material will help you achieve the results you want.

Contact us

We want to hear from you. So let us have your specific questions or just tell us what you think through any of the following:



[WTS MATHS & SCIENCE TUTORING](#)



[082 672 7928](#)



[@wtstutor](#)



kwvsibiya@gmail.com



[@wtstutor](#)



www.wtstutor.co.za

ACKNOWLEDGEMENT

DEPARTMENT OF EDUCATION PAST PAPERS



"WHERE TO START MATHS & SCIENCE TUTORING IS FOR THE NATION"

PREVENTION OF COVID-19



WEAR A MASK



CLEAN HANDS

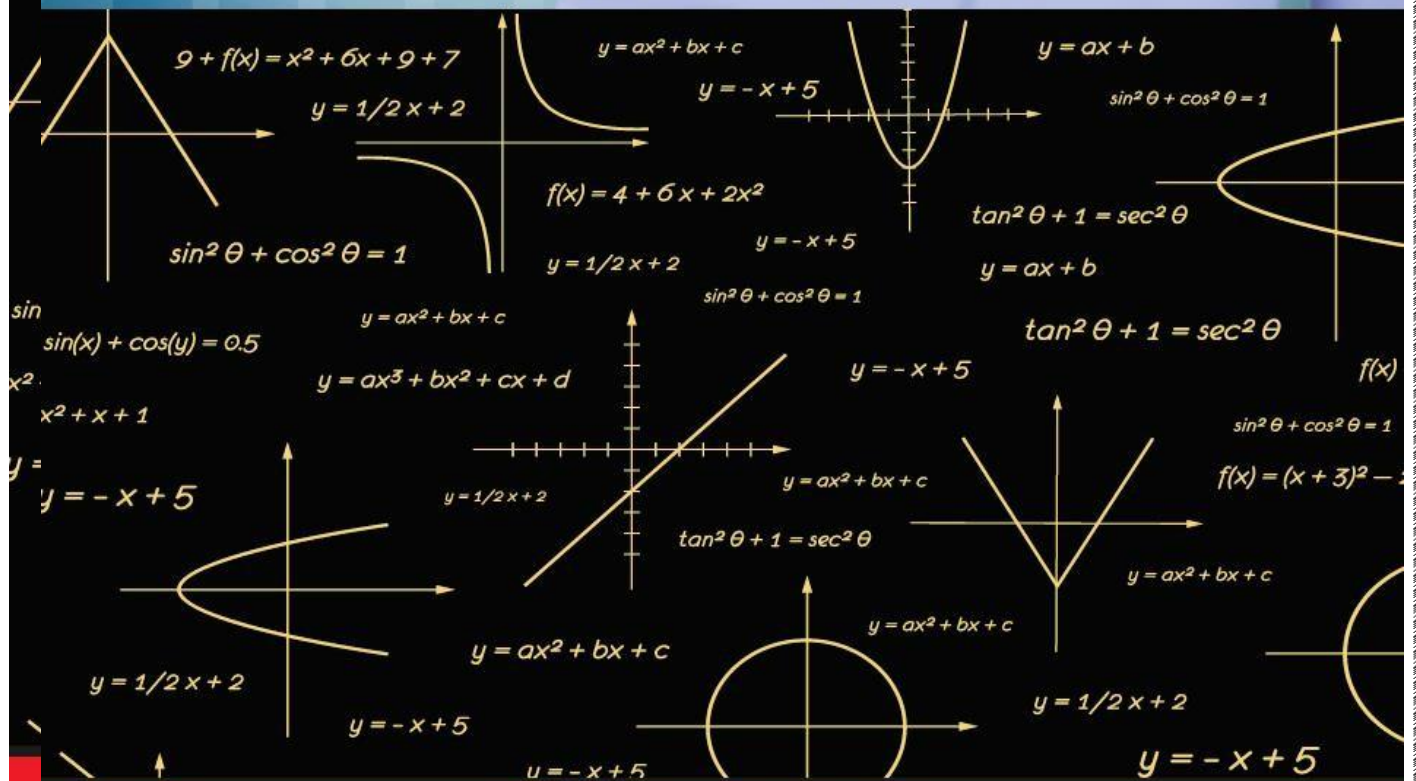


**MEASURE THE
TEMPERATURE**



WTS MATHS & SCIENCE TUTOR

-is for the nation-



by Dr. KW Sibiya

Design by Dumi Mbona

