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QUESTION 1 – 13 minutes

Taken from DoE/Prelim 2008

- 1.1. Given $f(x) = -x^2$
- 1.1.1. Determine $f'(x)$ from first principles. (5)
- 1.1.2. Determine the average gradient of $f(x)$ between $x=1$ and $x=3$ (3)
- 1.2. Determine $\frac{dy}{dx}$ if :
- 1.2.1. $y = (x^3 + 1)(x^2 - 2)$ (4)
- 1.2.2. $y = \frac{\sqrt{x}-4}{\sqrt{x}}$ (4)
- [16]**

QUESTION 2 – 9 minutes

Taken from DoE/Exemplar 2008

- 2.1. Determine $f'(x)$ from first principles if $f(x) = \frac{1}{x}$ (5)
- 2.2. Determine the derivatives of :
- 2.2.1. $f(x) = -5x^2 + 2x$ (1)
- 2.2.2. $y = \sqrt{x^3} + \frac{1}{3x^3}$ (4)
- [10]**

HOMEWORK

QUESTION 3 – 10 minutes

Taken from DoE/Additional Exemplar 2008

3.1. Determine $f'(x)$ by first principles if $f(x) = x^3$. (5)

3.2. Use differentiation rules to differentiate the following :

3.2.1. $y = \frac{2}{5\sqrt{x}} - \sqrt[3]{x}$ (4)

3.2.2. $y = \frac{x^4 - 3x^2 + 7}{x}$ (4)

[13]

QUESTION 4 – 3 minutes

Taken from DoE/Nov 2009

Determine $\frac{dy}{dx}$ by means of differentiation principles if :

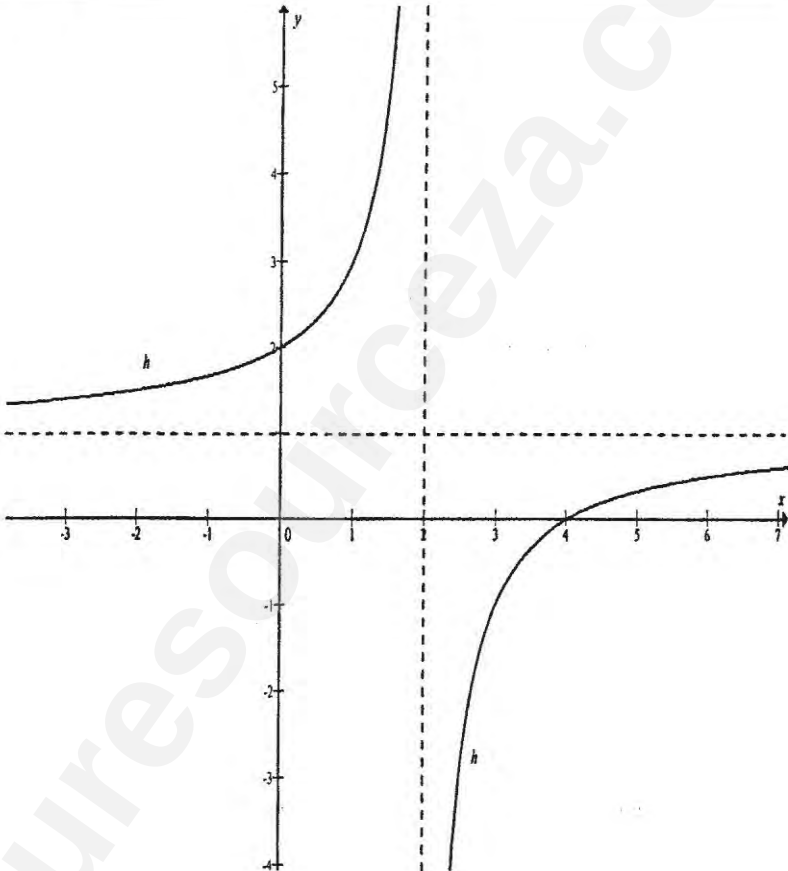
4.1. $y = 2\sqrt{x} - x^2$ (3)

4.2. $3 = x^2y$ (3)

[6]

SOLUTIONS

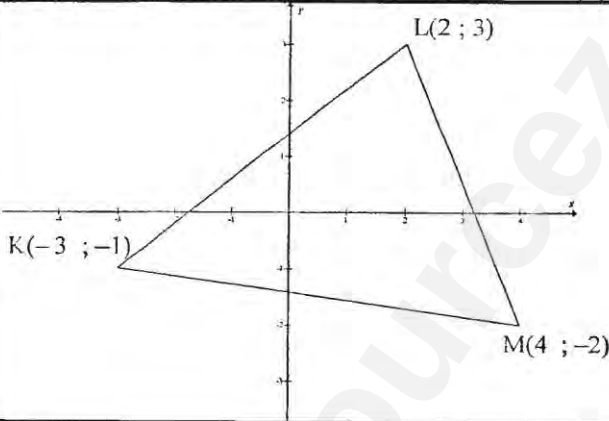
Session 6

1.1	$-2 = a(1)^2$ $-2 = a$	✓ one value of a 1
1.2	$y = 1$ $x = 2$	✓ y asymptote ✓ x asymptote 2
1.3		
	✓ asymptotes ✓ shape ✓ coordinate (3)	[6]

2.1.1	$y = 4^x$ $x = 4^y$ $y = \log_4 x$	$\checkmark x$ and y $\checkmark$ Correct base (2)
2.1.2	Yes, only one corresponding y value for every x value	$\checkmark$ yes $\checkmark$ reason (2)
2.1.3	$y = 4^x$ $y = 4^{-x}$ $y = \left(\frac{1}{4}\right)^x$ $h(x) = \left(\frac{1}{4}\right)^x$	$\checkmark 4^{-x}$ $\checkmark \left(\frac{1}{4}\right)^x$ (2)

2.2	$xy = k$ $1 \times 4 = k$ $g(x) = \frac{4}{x}$ $\therefore a = 4$	$\checkmark$ substitution of (1 ; 4) $\checkmark$ value for $a = 4$ (2)
2.3	$m(x) = \frac{4}{x-2} - 1$	$\checkmark x - 2$ $\checkmark -1$ (2)
2.4	$0 = \frac{4}{x-2} - 1$ $1(x-2) = 4$ $x = 6$ $\therefore (6;0)$ $m(0) = \frac{4}{0-2} - 1$ $m(0) = -3$ $\therefore (0;-3)$	$\checkmark$ Substitution $\checkmark$ x-intercept $\checkmark$ y-intercept (3) [13]

MATHEMATICS Grade 12 Session 7 (LEARNER NOTES)

	$C'(-2; -4) \sqrt{A} \sqrt{A}$ (2)	2A – 1 for x value 1 for y value
	$A'B' = 2\sqrt{29} \sqrt{A}$ (1)	A – for value of $A'B'$
	In a translation the shape and size of the original figure is retained, hence the lengths of the sides of the triangle will remain invariant under a translation. $\sqrt{A} \sqrt{A}$ (2)	2A – look for terms shape and size remaining the same /invariant
	Stage 1: (rotated 90° in a clockwise direction about the origin) $(x; y) \rightarrow (y; -x) \sqrt{M}$ Stage 2: (enlargement by factor of 0,5 through origin) $(x; y) \rightarrow (0,5x; 0,5y) \sqrt{M}$ Combining stages 1 and 2: $(x; y) \rightarrow (0,5y; -0,5x) \sqrt{CA} \sqrt{CA}$ (4)	M – application of transformation rule M – Application of second transformation rule 2CA – 1 for each ordinate
		$\sqrt{CA} \sqrt{CA} \sqrt{CA}$ 1 for each coordinate.
	$A(1; -2); A'(x'; y')$ $x' = x \cos \alpha - y \sin \alpha \sqrt{M}$ $= (1) \cos(60^\circ) - (-2) \sin(60^\circ) \sqrt{A}$ $= \frac{1}{2} + 2\left(\frac{\sqrt{3}}{2}\right)$ $= \sqrt{3} + \frac{1}{2} \sqrt{CA}$ $y' = y \cos \alpha + x \sin \alpha \sqrt{M}$ $= (-2) \cos(60^\circ) + 1 \sin(60^\circ) \sqrt{A}$ $= -1 + \left(\frac{\sqrt{3}}{2}\right) \sqrt{CA}$ $A'\left(\sqrt{3} + \frac{1}{2}; -1 + \frac{\sqrt{3}}{2}\right)$ (6) Or $A'(2,23; -0,13)$	M – formula A – substitution correctly into formula CA – answer M – formula A – substitution correctly into formula CA – answer

QUESTION 4

Let $r = OP = OP'$ The x co-ordinate of $P' = r \cos(\alpha + 30^\circ)$ $x' = r \cos(\alpha + 30^\circ)$ $= r(\cos \alpha \cdot \cos 30^\circ - \sin \alpha \cdot \sin 30^\circ)$ $= r \cos \alpha \cdot \cos 30^\circ - r \sin \alpha \cdot \sin 30^\circ$	✓ formula ✓ expansion ✓ simplification ✓ substitution
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$= r \cdot \frac{x}{r} \cos 30^\circ - r \cdot \frac{y}{r} \sin 30^\circ$ $= x \cdot \frac{\sqrt{3}}{2} - y \cdot \frac{1}{2}$ The y co-ordinate of P' is $r \sin(\alpha + 30^\circ)$ Similarly $y' = y \cos 30^\circ + x \sin 30^\circ$ $= y \cdot \frac{\sqrt{3}}{2} + x \cdot \frac{1}{2}$	✓ formula ✓ expansion ✓ simplification ✓ substitution (8)
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