

Calculus 1 – Derivatives Formula Sheet:

Basic Derivatives:	$\frac{d}{dx}[c] = 0 \quad \frac{d}{dx}[x] = 1 \quad \frac{d}{dx}[cx] = c$ $\frac{d}{dx}[c * f(x)] = c * f'(x)$
Trigonometric Derivatives:	$\frac{d}{dx}[\sin x] = \cos x \quad \frac{d}{dx}[\cos x] = -\sin x$ $\frac{d}{dx}[\tan x] = \sec^2 x \quad \frac{d}{dx}[\cot x] = -\csc^2 x$ $\frac{d}{dx}[\sec x] = \sec x \tan x \quad \frac{d}{dx}[\csc x] = -\csc x \cot x$
The Power Rule:	$\frac{d}{dx}[x^n] = nx^{n-1}$
The Product Rule:	$\frac{d}{dx}[uv] = u'v + uv'$ $\frac{d}{dx}[uvw] = u'vw + uv'w + uvw'$
The Quotient Rule:	$\frac{d}{dx}\left[\frac{u}{v}\right] = \frac{vu' - uv'}{v^2}$
The Reciprocal Rule:	$\frac{d}{dx}\left[\frac{1}{u}\right] = \frac{-u'}{u^2}$

The Chain Rule:	$\frac{dy}{dx} = \frac{dy}{du} * \frac{du}{dx}$ $\frac{d}{dx}[f(g(x))] = f'(g(x)) * g'(x)$ $\frac{d}{dx}[f(g(u))] = f'(g(u)) * g'(u) * u'$ $\frac{d}{dx}[f(x)]^n = n[f(x)]^{n-1} * f'(x)$
Trig Derivatives: “With Chain Rule”	$\frac{d}{dx}\sin(u) = \cos(u) u' \qquad \frac{d}{dx}\cos(u) = -\sin(u) u'$ $\frac{d}{dx}\tan(u) = \sec^2(u) u' \qquad \frac{d}{dx}\cot(u) = -\csc^2(u) u'$ $\frac{d}{dx}\sec(u) = \sec(u) \tan(u) u' \qquad \frac{d}{dx}\csc(u) = -\csc(u) \cot(u) u'$
Inverse Trig Derivatives: “With Chain Rule”	$\frac{d}{dx}[\sin^{-1}(u)] = \frac{u'}{\sqrt{1-u^2}} \qquad \frac{d}{dx}[\cos^{-1}(u)] = \frac{-u'}{\sqrt{1-u^2}}$ $\frac{d}{dx}[\tan^{-1}(u)] = \frac{u'}{1+u^2} \qquad \frac{d}{dx}[\cot^{-1}(u)] = \frac{-u'}{1+u^2}$ $\frac{d}{dx}[\sec^{-1}(u)] = \frac{u'}{ u \sqrt{u^2-1}} \qquad \frac{d}{dx}[\csc^{-1}(u)] = \frac{-u'}{ u \sqrt{u^2-1}}$
Exponential Derivatives:	$\frac{d}{dx}[e^u] = e^u * u'$ $\frac{d}{dx}[a^u] = a^u * u' * \ln a$
Derivatives of Logs:	$\frac{d}{dx}[\ln u] = \frac{u'}{u}$ $\frac{d}{dx}[\log_a(u)] = \frac{u'}{u \ln a}$

Logarithmic Differentiation:	$\frac{d}{dx}[u^v] = u^v \left[\frac{vu'}{u} + v' \ln(u) \right]$
Inverse Functions:	$\frac{d}{dx}[f^{-1}(a)] = \frac{1}{f'(b)} \quad f(b) = a \quad f^{-1}(a) = b$ $\frac{d}{dx}[f^{-1}(x)] = \frac{1}{f'[f^{-1}(x)]}$
Limit Definition:	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$
Alternative Definition:	$f'(a) = \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$