

Some useful Calculus Formulas

Derivative Formula:

$$\frac{d}{dx}f(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

Tangent line slope at point X = a:

$$\hat{f}(a) = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$$

$$\hat{f}(a) = \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$$

Multi-factor derivative, Product Rule:

$$y = uv$$

$$y' = u'v + v'u$$

$$y = u.v.w$$

$$y' = u'vw + v'u'w + w'u'v$$

Quotient rule:

$$y = \frac{u}{v}$$

$$y' = \frac{u'v - v'u}{v^2}$$

Composite Function, Chain Rule:

$$y = f \circ g \circ h(x)$$

$$y' = f'g'h'$$

Tangent Line formula at a given point (a, f(a)):

$$y = f'(a)(x - a) + f(a)$$

Absolute Value:

$$|u| = \sqrt{u^2}$$

$$\frac{d}{dx}|u| = \frac{d}{dx}\sqrt{u^2} \quad \text{or}$$

$$\frac{d}{dx}|u| = \frac{2u}{2\sqrt{u^2}} = \frac{u}{|u|}$$

Inverse Function:

$$\frac{d}{dx}(f^{-1}(x)) = \frac{1}{\frac{d}{dx}f(f^{-1}(x))}$$

or

$$(f^{-1}(x))' = \frac{1}{f'(f^{-1}(x))}$$