MCV4U: Calculus and Vectors, Grade 12, University Preparation

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$f'(x) = y' = \frac{dy}{dx}$$

If $h(x) = f(x)g(x)$, then $h'(x) = f'(x)g(x) + f(x)g'(x)$

If $h(x) = \frac{f(x)}{g(x)}$, then $h'(x) = \frac{f'(x)g(x) - f(x)g'(x)}{(g(x))^2}$

If $h(x) = f(g(x))$, then $h'(x) = f'\big(g(x)\big)g'(x)$

If $h(x) = e^{g(x)}$, then $h'(x) = e^{g(x)}g'(x)$

If $h(x) = b^{g(x)}$, then $h'(x) = b^{g(x)}g'(x)\ln b$

If $h(x) = \sin(g(x))$, then $h'(x) = \cos\big(g(x)\big)\, g'(x)$

If $h(x) = \cos(g(x))$, then $h'(x) = -\sin\big(g(x)\big)\, g'(x)$

$$\vec{a} \cdot \vec{b} = a_1 b_1 + a_2 b_2 + a_3 b_3$$

$$\vec{a} \times \vec{b} = (a_2 b_3 - a_3 b_2, a_3 b_1 - a_1 b_3, a_1 b_2 - a_2 b_1)$$

Scalar Projection of $\vec{a}$ onto $\vec{b}$: $\frac{\vec{a} \cdot \vec{b}}{|\vec{b}|}$

Vector Projection of $\vec{a}$ onto $\vec{b}$: $\frac{\vec{a} \cdot \vec{b}}{|\vec{b}|^2} \vec{b}$

$$(x, y, z) = (x_0, y_0, z_0) + t(a, b, c)$$

$$(x, y, z) = (x_0, y_0, z_0) + t(a, b, c) + s(d, e, f)$$

$$x = x_0 + at + ds, \qquad y = y_0 + bt + es, \qquad z = z_0 + ct + fs$$

$$Ax + By + Cz + D = 0$$

$$W = \vec{F} \cdot \vec{d}$$

$$ARC = \frac{\Delta y}{\Delta x}$$

$$IRC = \lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x}$$

$$\frac{dy}{dx} = \frac{d}{dx} f(x)$$

$$\frac{d}{dx} x^n = nx^{n-1}$$

$$\frac{d}{dx} f(g(x)) = f'(g(x))g'(x)$$

$$\vec{a} \cdot \vec{b} = \| \vec{a} \| \| \vec{b} \| \cos\theta$$

$$\frac{x - x_0}{u_x} = \frac{y - y_0}{u_y} = \frac{z - z_0}{u_z}$$

$$\begin{cases} x = x_0 + tu_x \\ y = y_0 + tu_y \\ z = z_0 + tu_z \end{cases}$$

$$\begin{cases} x = x_0 + su_x + tv_x \\ y = y_0 + su_y + tv_y \\ z = z_0 + su_z + tv_z \end{cases}$$