# MATH 210
## RULES FOR DIFFERENTIATION

ATOMIC RULES

COMBINATION RULES

$$\frac{\mathrm{d}}{\mathrm{d}x} x^\alpha = \alpha x^{\alpha-1}$$

$$\frac{\mathrm{d}}{\mathrm{d}x} e^x = e^x$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \ln x = \frac{1}{x}$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \sin x = \cos x$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \cos x = -\sin x$$

$$\frac{\mathrm{d}}{\mathrm{d}x} c \cdot f(x) = c \cdot f'(x)$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \left( f(x) + g(x) \right) = f'(x) + g'(x)$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \left( f(x) - g(x) \right) = f'(x) - g'(x)$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \left( u(x) \cdot v(x) \right) = u'(x)v(x) + u(x)v'(x)$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \left( \frac{u(x)}{v(x)} \right) = \frac{u'(x)v(x) - u(x)v'(x)}{v(x)^2}$$

$$\frac{\mathrm{d}}{\mathrm{d}x} b^x = \ln(b) \cdot b^x \qquad (b > 0 \text{ and } b \neq 1)$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \log_b(x) = \frac{1}{\ln(b)x} \qquad (b > 0 \text{ and } b \neq 1)$$

$$\frac{\mathrm{d}}{\mathrm{d}x} f(u(x)) = f'(u(x)) \cdot u'(x)$$

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{\mathrm{d}y}{\mathrm{d}u} \cdot \frac{\mathrm{d}u}{\mathrm{d}x}$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \tan x = \sec^2 x$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \sec x = \sec x \tan x$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \cot x = -\csc^2 x$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \csc x = -\csc x \cot x$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \arcsin x = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \arccos x = -\frac{1}{\sqrt{1-x^2}}$$

$$\frac{\mathrm{d}}{\mathrm{d}x} \arctan x = \frac{1}{1+x^2}$$