

MATH 2B Review: Derivatives

Facts to Know:

Table of Derivatives:

$$\frac{d}{dx} c = 0$$

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

$$\frac{d}{dx} \ln(x) = \frac{1}{x}$$

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

$$\frac{d}{dx} b^x = b^x \cdot \ln(b)$$

$$\frac{d}{dx} \sin(x) = \cos(x)$$

$$\frac{d}{dx} \cos(x) = -\sin(x)$$

$$\frac{d}{dx} \tan(x) = \sec^2(x)$$

$$\frac{d}{dx} \csc(x) = -\csc(x) \cot(x)$$

$$\frac{d}{dx} \sec(x) = \sec(x) \tan(x)$$

$$\frac{d}{dx} \cot(x) = -\csc^2(x)$$

$$\frac{d}{dx} \arcsin(x) = \frac{-1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx} \arccos(x) = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx} \arctan(x) = \frac{1}{1+x^2}$$

$$\text{Derivative Rules: } \frac{d}{dx} f(x) + g(x) = f'(x) + g'(x) \quad \frac{d}{dx} c f(x) = c f'(x)$$

Examples:

1. Find the derivative of $\sqrt{x}$.

$$\sqrt{x} = x^{1/2} \leftarrow \text{power rule}$$

$$\frac{d}{dx} \sqrt{x} = \frac{d}{dx} x^{1/2} = \frac{1}{2} x^{\frac{1}{2}-1} = \frac{1}{2} x^{-1/2} = \frac{1}{2 x^{1/2}} = \frac{1}{2\sqrt{x}}$$

2. Find the derivative of $3\sqrt{x} + \arctan(x)$.

$$\frac{d}{dx} 3\sqrt{x} + \arctan(x) = \frac{d}{dx} 3\sqrt{x} + \frac{d}{dx} \arctan(x)$$

$$= 3 \frac{d}{dx} \sqrt{x} + \frac{d}{dx} \arctan(x)$$

$$= 3 \cdot \frac{1}{2\sqrt{x}} + \frac{1}{1+x^2} = \boxed{\frac{3}{2\sqrt{x}} + \frac{1}{1+x^2}}$$