Derivatives of Trigonometric Functions

1. **Derivative of Sine and Cosine**: The functions $y = \sin(x)$ and $y = \cos(x)$ are differentiable and

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

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

2. **Derivatives of Standard Trigonometric Functions**:

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

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

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

The Chain Rule

If f and g are both differentiable and $F = f \circ g$ is the composite function defined by $F(x) = f(g(x))$ then F is differentiable and F' is given by the product

$$F'(x) = f'(g(x))g'(x)$$

In Leibniz notation if $y = f(u)$ and $u = g(x)$ are both differentiable then

$$\frac{dy}{dx} = \frac{dy}{du}\frac{du}{dx}$$