

## Derivative Review

### Basic Derivative Rules

$$1) \frac{d}{dx}(c) =$$

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

$$3) \frac{d}{dx}(x^n) =$$

$$4) \frac{d}{dx}(cf(x)) =$$

$$5) \frac{d}{dx}[f(x) \pm g(x)] =$$

Note: With these rules we can take the derivatives of polynomials

$$\text{Ex: } \frac{d}{dx}(x^7 - 12x^6 + 3x^4 - x^2 + 4x + 3)$$

Product Rule:

$$\frac{d}{dx} [f(x)g(x)]$$

Quotient rule:

$$\frac{d}{dx} \left[ \frac{f(x)}{g(x)} \right] =$$

Ex: FIND  $\frac{dy}{dx}$

$$1) y = (\sqrt{x} + 3x^2)(x^2 + 2x + \pi)$$

$$2) y = \frac{x^2 + x - 3}{x^4 + 1}$$

Chain Rule: IF  $f$  AND  $g$  ARE BOTH DIFFERENTIABLE THEN

$$\frac{d}{dx} [f(g(x))]$$

## Derivatives of Trigonometric Functions

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

$$\frac{d}{dx}(\csc x)$$

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

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

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

$$\frac{d}{dx}(\cot x)$$

Ex: Find the derivatives of the following functions

1)  $y = \sin(x^2+1)$

2)  $y = \cos^3(2x-1)$

3)  $y = (x^4-1)^{1000}$

4)  $f(t) = \left(\frac{t-2}{2t+1}\right)^9$

## Logarithmic and Exponential Functions

$$\frac{d}{dx}(a^x)$$

$$\frac{d}{dx}(\log_a x)$$

$$\frac{d}{dx}(e^x)$$

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

Ex: Find the derivatives of the following functions

1)  $y = e^{\csc(x^2 - 2x)}$

2)  $y = \log_5(x^3 + \cos x \sin x)$

## Derivatives of Inverse Trigonometric Functions

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

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

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

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

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

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

Ex: Find the derivative of  $f(x) = \sqrt{\arctan x}$

Ex: Find the derivatives of the following functions

$$1) y = \frac{x^2 - 2\sqrt{x}}{x}$$

$$2) y = x \sin x - \tan^2 x$$

$$3) y = \cot^2(3\theta)$$

$$4) y = x \sin \frac{1}{x}$$

$$5) y = \sqrt{\cos(\sin^2 x)}$$

$$6) y = \ln(\sec x + \tan x)$$

$$7) y = e^{t \sin t}$$

$$8) y = \arctan \sqrt{x}$$

$$9) y = x \ln(\sec^{-1} x)$$