Calculus BC

Section 2.3 - Products and Quotient Rules and Higher-Order Derivatives

Obj: - To find the derivative of a function using the Product Rule and Quotient Rule

- **Product Rule**

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

(left d right + right d left)

- **Quotient Rule**

$$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$$

lo d hi - hi d lo
lo lo

1. $y = (4x^2 + 3)(5x - 1)$

$y' =$

2. $y = \dfrac{x^2 + 1}{x^3}$

$y' =$

Derivatives of Trig Functions

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

$$\frac{d}{dx}\sec x = \sec x \tan x \qquad \frac{d}{dx}\csc x = -\csc x \cot x$$

$$\frac{d}{dx}\tan x = \sec^2 x \qquad \frac{d}{dx}\cot x = -\csc^2 x$$

3. find $\dfrac{d}{dx}\sec x \cot x$

4. find $\frac{d}{dx}\left(-\frac{1}{\cot x}+\frac{1}{\csc x}\right)$

-rewrite function

Position, Velocity, Acceleration:

- **Position** $s(t)$
  -position can be height or a point on a number line.

- **Velocity** $v(t)$
  -velocity (instantaneous) is $s'(t)$

- **Acceleration** $a(t)$
  -acceleration is the change in velocity
  -acceleration is $v'(t)$
  -acceleration is $s''(t)$

5. On the moon, a ball is dropped from a height of 100 ft. Its height s (in feet) above the moon's surface is given by $s(t)=-\frac{27}{10}t^2+100$

   a) find the height at $t=5$

b) find the velocity at $t = 5$

c) find the acceleration at $t = 5$