MATH 1325

Chapter 11.5: Techniques For Finding Derivatives

NOTATIONS FOR THE DERIVATIVE

$$f'(x) \quad y' \quad \frac{dy}{dx} \quad \frac{d}{dx}[f(x)] \quad D_x y \quad D_x[f(x)]$$

CONSTANT RULE: $f(x) = K$

$$f'(x) = 0$$

FIND THE DERIVATIVE.

$f(x) = 25$ $\qquad$ $f(x) = 4^3$ $\qquad$ $f(x) = \pi + 1$

POWER RULE: $f(x) = x^N$

$$f'(x) = N x^{N-1}$$

FIND THE DERIVATIVE.

$f(x) = x^8$ $\qquad$ $f(x) = x^2$ $\qquad$ $f(x) = x$

$f(x) = x^{\frac{3}{2}}$ $\qquad$ $f(x) = \sqrt[3]{x}$ $\qquad$ $f(x) = \frac{1}{x^3}$

CONSTANT TIMES A FUNCTION RULE: $f(x) = K \cdot g(x)$

$f'(x) = K \cdot g'(x)$

FIND THE DERIVATIVE.

$f(x) = 8x^4$

$f(x) = -\frac{3}{4}x^{12}$

$f(x) = 15x$

$f(x) = \frac{6}{x^2}$

$f(x) = \frac{1}{6x^2}$

$f(x) = \frac{6x^4}{\sqrt{x}}$

SUM AND DIFFERENCE RULES: $f(x) = g(x) \pm h(x)$

$f'(x) = g'(x) \pm h'(x)$

FIND THE DERIVATIVE.

$f(x) = 6x^3 + 15x^2$

$f(x) = 8x^4 - 6\sqrt{x} + \frac{5}{x}$

$f(x) = 5\sqrt[3]{x^2} + \frac{4}{x^2} + 7$

$f(x) = \frac{1 + 3x^4 + 10x^8}{x^4}$

A person leans out over the edge of a balcony and throws a ball directly upward. The ball rises and then falls to the ground below. The position of the ball in feet above the ground after t seconds is given by $s(t) = -16t^2 + 64\,t + 80$.

a. Find the initial position of the ball.

b. Find the initial velocity.

c. Find the velocity at $t = 2$.

d. Find the velocity at $t = 3$.

e. Find t when the ball hits the ground.

f. Find the impact velocity.

Marginal Cost: the rate of change of cost
the cost of making one more item after x items have been made

Marginal Revenue

Marginal Profit

A land developer has purchased 115 acres in the mountains to subdivide and sell as one-acre lots for mountain homes. Construction of gravel roads to access the lots is more expensive at higher elevations on the property. The cost of access roads in thousands of dollars for x lots is given by $C(x) = 150 + 9x + .5x^{1.6}$ with $0 \leq x \leq 115$.

Find and interpret the marginal cost for the given values of x.

$x = 25$ $x = 50$

A cone is growing. While the radius of the base of the cone stays constant at 2 mm, the height of the cone is increasing. Find the rate of change of the volume of the cone with respect to the height.