Calculus BC

Section 2.2 - Basic Differentiation and Rates of Change

Obj: - To find the derivative of a function using basic differentiation rules.

Rules for Differentiation:

- $\frac{d}{dx}c = 0$
- $\frac{d}{dx}x^n = nx^{n-1}$ where $n \in \mathbb{Q}$
- $\frac{d}{dx}cf(x) = c \cdot f'(x)$
- $\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$
- $\frac{d}{dx}\sin x = \cos x$
- $\frac{d}{dx}\cos x = -\sin x$

1. $y = 2x^4 + \frac{x^3}{3} + \frac{3x^2}{4} + 5$

$y' =$

2. $y = \frac{2}{x}$

a) find $\frac{dy}{dx}$

-rewrite y

b) find $\frac{d^2y}{dx^2}$ or y''

3. $y = \frac{2}{5x^2} - 3\cos x$

$y' =$

Average Velocity:

Since rate = $\frac{\text{distance}}{\text{time}}$ then

Average velocity = $\frac{\triangle \text{distance}}{\triangle \text{Time}}$

(average velocity is over an interval of time)

Instantaneous velocity:

Instantaneous velocity = the derivative of the position function

(instantaneous velocity is at that moment)

Speed:

Speed = $|$ velocity $|$

(velocity has direction, it can be + or -)

4. If a ball is dropped from the top of a building that is 200 ft tall, and air resistance is neglected, the height s (in feet) of the ball at time t (in seconds) is given by

$s(t) = -16t^2 + 200$

a) find the average velocity over the interval $[1,3]$

Average velocity = $\frac{\triangle \text{distance}}{\triangle \text{Time}}$

-find $s(3)$ and $s(1)$
-find the change in Distance
-find the change in Time

b) find the instantaneous velocity at $t = 2$.

-find the derivative of the position function $s(t)$
-notation:
$s'(t)$ is called $v(t)$

c) find the speed at $t = 2$.