**Mr. Visca’s: Calculus (Chpt 3.4)**

**Chpt 3 – Day 6: Velocity & other Rates of change**

**3.4 Velocity and Other Rates of Changes**

Recall: The instantaneous rate of change of *f(x)* at *x* = a is the derivative

Example: Find the rate of change of the area of a circle with respect to its radius *r* at *r*=5.

s(t) is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or distance of a moving object.

v(t) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the rate of change of position.

Note: velocity includes an object's speed and direction.

\*\*\*Velocity is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of position.\*\*\*

a(t) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the rate of change of velocity.

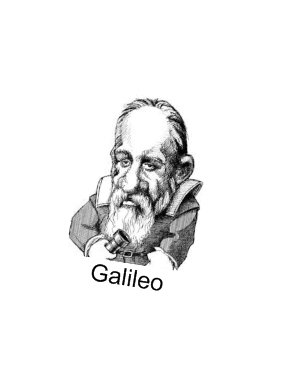
\*\*\*Acceleration is the derivative of velocity.\*\*\*

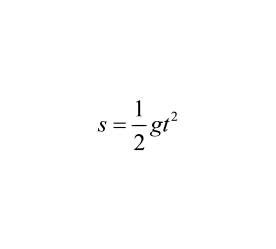
Therefore,

position, s(t) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

velocity, v(t) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ derivative

acceleration, a(t) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ derivative

Free-fall constants on Earth (acceleration due to gravity)

A falling object starting at rest will accelerate at a rate:

 g = 32 ft/sec2 or  g = 9.8 m/sec2

The distance of a falling object starting at rest is:

English Units (\_\_\_\_\_\_\_\_\_\_\_) Metric Units (\_\_\_\_\_\_\_\_\_\_\_)

gravity: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ gravity: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Example:

A ball is dropped from the top of a 200 ft. building.

a) How long does it take to hit the ground?

b) What is the velocity after 3 seconds?

Example:

A dynamite blast propels a heavy rock straight up with a launch velocity of 160 ft./sec. It reaches a height of

s = 160t - 16t2 feet after t seconds.

a) How high does it go? (hint: what is the velocity at the high point?)

b) What is its velocity when the rock is 256 ft above ground on the way up? On the way down?

c) What is the acceleration of the rock at any time t?

d) When does the rock hit the ground?

Example:

A particle moves along a line so that its position at any time is s(t) = t2 - 4t + 3. (s in meters and t in seconds).

a) Find the displacement of the particle during the first 2 seconds?

b) Find the average velocity during the first 4 seconds?

c)Find the instantaneous velocity at t=4?

d) Find the acceleration at t=4?

e) At what value of t does the particle change directions?

HW: section 3.4

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