

Notes: Rectilinear Motion

Day 6

Example(s) One: Let  $A = \pi r^2$  be the area of a circle of radius  $r$ .

A. Calculate the Rate of Change of the area with respect to the radius.

B. Compute  $\frac{dA}{dr}$  for  $r = 2$  and  $r = 5$ .

Example(s) Two: The stopping distance of an automobile after the brakes are applied (in feet) is given by the function  $F(s) = 1.1s + .05s^2$  for speeds  $s$  between 30 and 75 seconds.

A. Find the stopping distance when  $s = 30$  seconds.

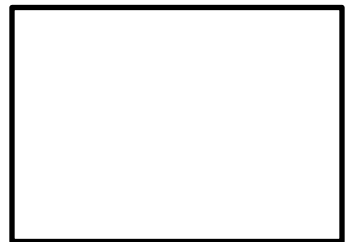
B. Find the average ROC between [30seconds, 31seconds].

C. Find the instantaneous ROC at 30seconds.

Galileo's Height and Velocity Function:

$$s(t) = s_0 + v_0t - \frac{1}{2}gt^2$$

D  
Galileo's Height  
& Velocity  
Function



■ gravity  $\approx 32 \frac{ft}{sec^2}$  or ■ gravity  $\approx 9.8 \frac{m}{sec^2}$

$s(t) =$

$v(t) =$

$a(t) =$



Example(s) Three: A slingshot launches a stone vertically with an initial velocity  $300 \text{ ft/sec}$  from an initial height of  $6 \text{ feet}$ .

A. Find the stones height at  $t = 2$  and  $t = 12$ .

B. Find the stones velocity at  $t = 2$  and  $t = 12$ .

C. What is the stones maximum height? When does it reach that height?

D. When does the stone hit the ground?

Example Four: A bullet is fired vertically from an initial height of  $0 \text{ km}$ . What is the initial velocity required for the bullet to reach a maximum height of  $2 \text{ km}$ ?

Example(s) Five: (Try It)

- A. Write the volume  $V$  of a cube as a function of the side length  $s$ .
- B. Find the instantaneous ROC of the volume with respect to a side  $s$ .
- C. Evaluate the ROC of  $V$  at  $s = 1$  and  $s = 5$ .

Example(s) Six: (Try It) A dynamite blast propels a heavy rock straight up with a launch velocity of  $160 \frac{\text{feet}}{\text{second}}$ .

- A. Write a height function.
- B. How high does the rock go?
- C. What is the velocity of the rock when it is 256 feet above the ground.
- D. When does the rock hit the ground?