Name: Key

12.3 (part 2)

$$m = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$v(t) = \lim_{h \to 0} \frac{f(t+h) - f(t)}{h}$$

1) **[Review]** Find the slope of the tangent line to the graph of $f(x) = 5x^3$ at (2, 40).

Submit your response via Socrative: 08EC238B (it's a zero)

$$\frac{f(2+h) - 40}{h}$$

$$\frac{5(h+2)^3 - 40}{h}$$

$$\frac{5(h^3 + 6h^2 + 12h + 8) - 40}{h}$$

$$\frac{5h^3 + 30h^2 + 12h + 40 - 40}{h}$$

$$\frac{h(5h^2 + 30h + 60)}{h}$$

$$5(0)^2 + 30(0) + 60$$

$$\boxed{60}$$

[12.3 part 1]

Ex. A: Find an equation for the slope of the graph of $y = x^2 + 3x$ at any point.

$$\frac{f(x+h) - f(x)}{h}$$

$$\frac{(x+h)^2 + 3(x+h) - [x^2 + 3x]}{h}$$

$$\frac{x^2 + 2xh + h^2 + 3x + 3h - x^2 - 3x}{h}$$

$$\frac{h^2 + 2xh + 3h}{h}$$

$$\frac{h(h + 2x + 3)}{h}$$

$$(0) + 2x + 3$$

$$\boxed{2x + 3}$$

2) Find an equation for the slope of the graph of $y = x^2 + 3x - 2$ at any point.

Submit your response via Socrative.

$$\frac{(x+h)^2 + 3(x+h) - 2 - [x^2 + 3x - 2]}{h}$$

$$\frac{x^2 + 2xh + h^2 + 3x + 3h - 2 - x^2 - 3x + 2}{h}$$

$$\frac{h^2 + 2xh + 3h}{h}$$

$$\frac{h(h + 2x + 3)}{h}$$

$$0 + 2x + 3$$

$$\boxed{2x + 3}$$

Ex. B: Tourist standing on a 300 foot tall viewing tower often drop coins into the fountain below. The height of a coin falling from the tower after t seconds is given by:

$$h(t) = 300 - 16t^2$$

i) Find the equation for the instantaneous velocity $v(t)$ of the coin at any point in time.

$$\frac{300 - 16(h+t)^2 - [300 - 16t^2]}{h}$$

$$\frac{300 - 16t^2 - 32ht - 16h^2 - 300 + 16t^2}{h}$$

$$\frac{-16h^2 - 32ht}{h}$$

$$\frac{-16h(h + 2t)}{h}$$

$-16(h+2t)$ or $-16h - 32t$

ii) Find the instantaneous velocity $v(t)$ of the coin at 2 seconds.

$-32t$

downward $-32(2)$

-64 ft/sec

3) A billiard ball is dropped from a height of 100 feet. The ball's height s at time t is the position function:

$$s = -16t^2 + 100$$

where s is measured in feet and t is measured in seconds. What's the ball's instantaneous velocity at $t = 1$ and $t = 2$?

Submit your response via Socrative.

$$\frac{-16(h+t)^2 + 100 - [-16t^2 + 100]}{h}$$

$$\frac{-16h^2 - 32ht + 16t^2 + 100 + 16t^2 - 100}{h}$$

$$\frac{h(-16h - 32t)}{h}$$

$-16(0) - 32t$

$-32t$

$t = 1$ is -32 ft/sec

$t = 2$ is -64 ft/sec