32. $3 - \frac{3}{5t^1}$

$3 - \frac{3}{5}t^{-1}$

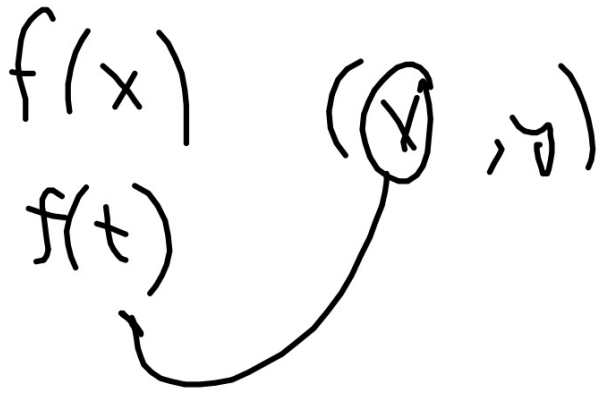
$\frac{3}{5}t^{-2}$

$\frac{3x^2}{5}$

$\frac{3}{5x^{-2}}$

$2 + 3\cos t$

$-3\sin t$



2.2B Applications

A. What is a derivative?

- rate of change
- $\frac{\Delta y}{\Delta x}$

1. position = $s(t)$

$$s(t) = \frac{1}{2}gt^2 + V_0 t + S_0$$

- g: $-9.8\ m/sec^2$ or $-32\ ft/sec^2$
- $\frac{1}{2}gt^2$: gravity
- $V_0 t$: + Starting velocity
- S_0: Starting position

Ex. An object is dropped off a 120 ft. building.

$$s(t) = \frac{1}{2}(-32)t^2 + 0t + 120$$

$$s(t) = -16t^2 + 120$$

$s(2) = 56$

$s(1) = 104$

* $s(0) = -16(0)^2 + 120 = 120$

$$0 = -16t^2 + 120$$

$+16t^2 \quad +16t^2$

$$\frac{16t^2}{16} = \frac{120}{16}$$

$$\sqrt{t^2} = \sqrt{7.5}$$

$$t = \pm 2.738$$

Avg. velocity on $[1,2]$

$$\frac{s(2)-s(1)}{2-1} = \frac{56-104}{1} = -48 \frac{ft}{sec}$$

Velocity at $t=1$, $-16t^2+120$

$s(t) = -16t^2+120$

$v(t) = -32t$

Velocity at $t = 5$

$v(5) \rightarrow$ 1st derivative

Avg. velocity $[2,3]$ $\dfrac{s(3) - s(2)}{3 - 2}$

$$s(t) \rightarrow s'(t)$$

$$s'(t) = v(t)$$

A ball is thrown up at 40 ft/sec by a 6 foot man

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

$s(t) = -16t^2 + 40t + 6$

$v(t) = -32t + 40$

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