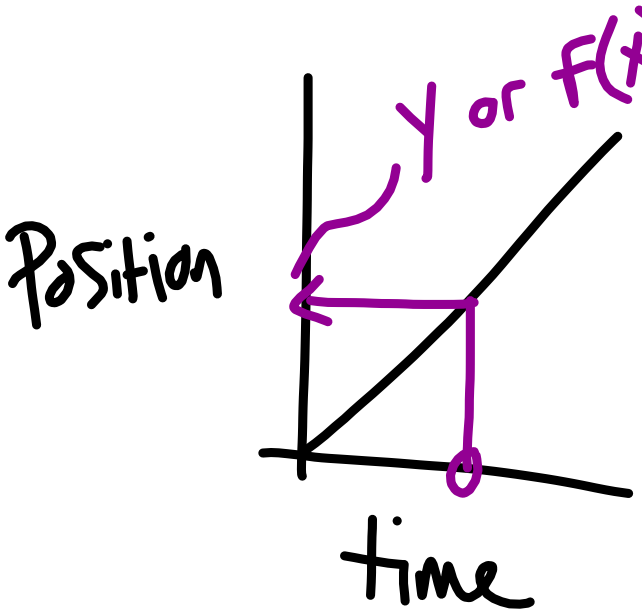
From Yesterday...

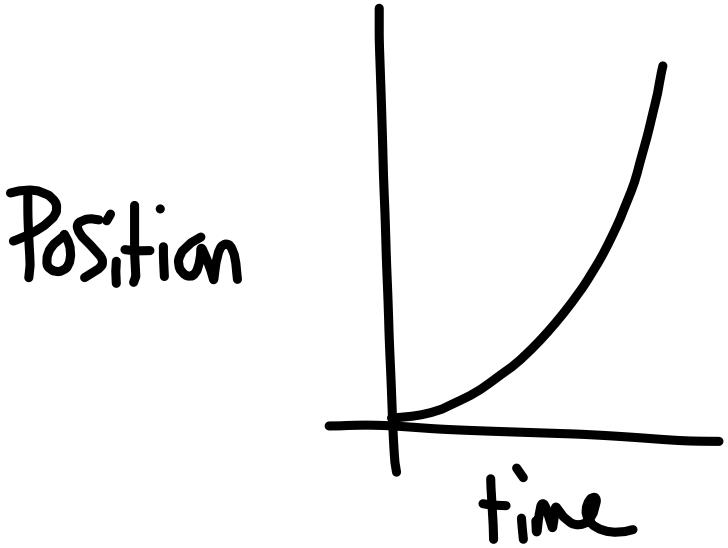


$Y = mx + b$

$f(x) = mx + b$

$f(x) = 120x + 0$

What if you Start Falling?



$f(x)=\frac{1}{2}gx^2$

$f(x)=\frac{1}{2}(9.81)x^2$

$F(x)=5x^2$

How fast is it going at $t=1$ sec?

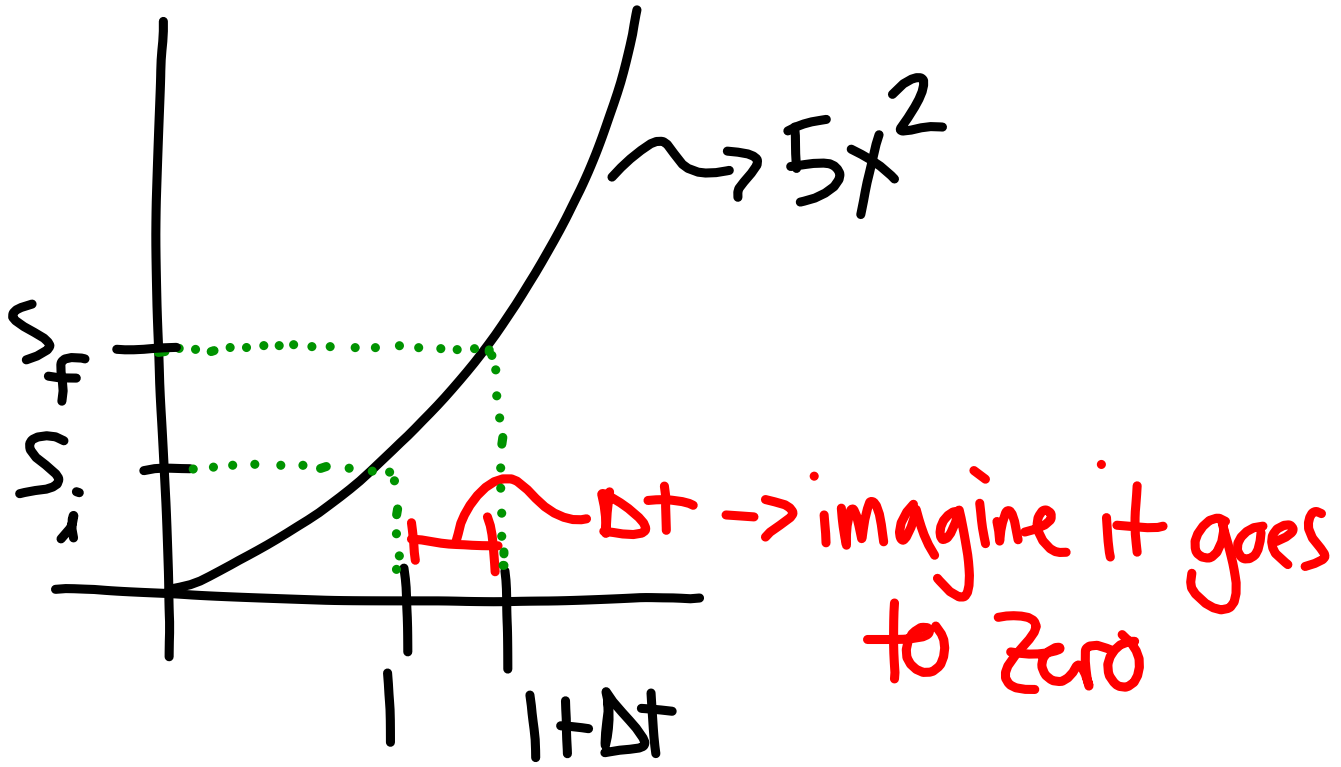
$$\text{Speed} = \frac{\Delta \text{Position}}{\Delta \text{time}} = \frac{5}{1} = 5\ \frac{\text{km}}{\text{hr}}$$

Δ Position → s

$\frac{5}{1}$ → $\frac{s_f - s_i}{t_f - t_i}$

average Speed

from 0 - 1 Sec.


$5x^2$
S_f
S_i
Δt -> imagine it goes to zero
1
$1+\Delta t$

$$\text{Speed} = \frac{s_f - s_i}{t_f - t_i} = \frac{\left[5(1+\Delta t)^2\right] - \left[5(1)^2\right]}{\left[1+\Delta t\right] - \left[1\right]} \quad \Delta t$$

$$5(1+\Delta t)(1+\Delta t) - 5$$

$$5(1+2\Delta t+\Delta t^2) - 5$$

$$5 + 10\Delta t + 5\Delta t^2 - 5$$

$$10\Delta t + 5\Delta t^2$$

$$\text{Speed} = \frac{10\Delta t + 5\Delta t^2}{\Delta t} = 10 + 5\Delta t$$

↳ goes to zero

Speed at $t = 1$ hr. $= 10 \frac{\text{km}}{\text{hr}}$

AND Slope at $t = 1$

Original

$F(x) = 5x^2$

Slope at $t=1$

derivative

$F'(x) = 10x^1$

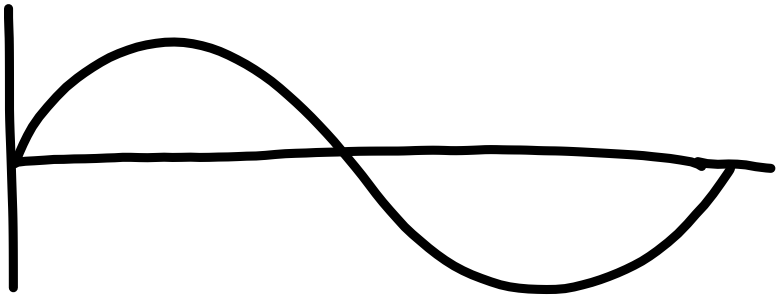
↳ gives Slope at <u>any</u> x value!

$g(x) = 3x^3$ $g'(x) = 9x^2$

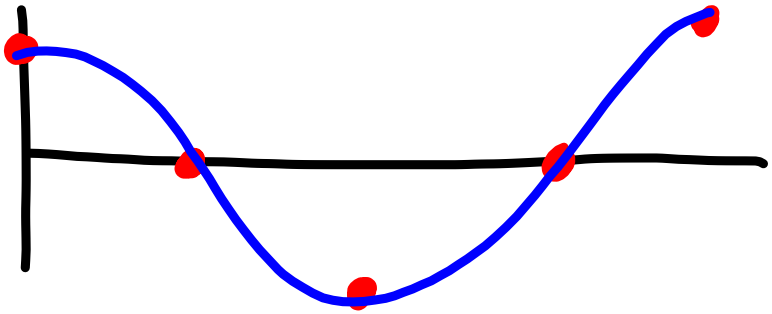
① multiply exponent by Coefficient
② Put that infront of the variable
③ decriment exponent by 1

$h(x) = 4x^{-2}$ $h'(x) = -8x^{-3}$

$f(x)=\sin x$



$f'(x)=\cos x$



Derivatives Practice

① $f(x) = 3x^4 - 7x^2$

$f'(x) = 12x^3 - 14x^1$

(3) $f(x) = \frac{3}{x^3} \rightsquigarrow 3x^{-3}$

$f'(x) = -9x^{-4}$

$f'(7) = -9(7)^{-4} \rightsquigarrow \frac{-9}{1} \cdot \frac{1}{7^4}$

$f'(7) = \frac{-9}{2401}$

Circles

$C_o = 2\pi r$

$A_o = \pi r^2$

$SA_o = 4\pi r^2$

$V_o = \frac{4}{3}\pi r^3$