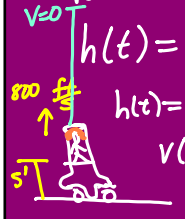
December 15, 2023

RECTILINEAR MOTION

Vertical Motion

$a = -32 \frac{ft}{s^2}$

$a = -9.8 \frac{m}{s^2}$



$h(t) = \frac{1}{2}at^2 + V_0t + S_0$

$h(t) = -16t^2 + 800t + 5$

$v(t) = -32t + 800$

$a(t) = -32$

How high will John travel?

$0 = -32t + 800$

$32t = 800$

$t = 25$ sec

$h(25) = -16(25)^2 + 800(25) + 5$

$= 10{,}005$ ft.

How fast will he be moving when he falls back to a height of 1000 ft.

$1000 = -16t^2 + 800t + 5$

$0 = -16t^2 + 800 - 995$

$t = \frac{-800 \pm \sqrt{800^2 - 4(-16)(-995)}}{2(-16)}$

$t = 1.3$

$t = 48.7$

$v(t) = -32t + 800$

$v(t) = -32(48.7) + 800$

$= -758.4$ ft/s

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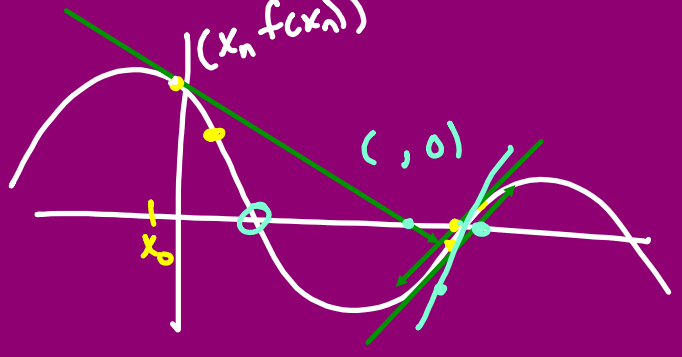
Newton's Method

$f(x) = x^3 - 3x - 1$



$y - y_1 = m(x - x_1)$

$y - f(x_n) = f'(x_n)(x - x_n)$

$0 - \frac{f(x_n)}{f'(x_n)} = \frac{f'(x_n)(x - x_n)}{f'(x_n)}$

$f(x) = x^3 - 3x - 1 \quad [-4, 1]$

$-\frac{f(x_n)}{f'(x_n)} = x - x_n$

$x - \frac{x^3 - 3x - 1}{3x^2 - 3}$

$$\boxed{x_n - \frac{f(x_n)}{f'(x_n)} = x}$$