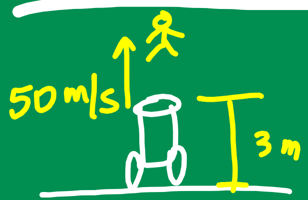
VERTICAL RECTILINEAR MOTION



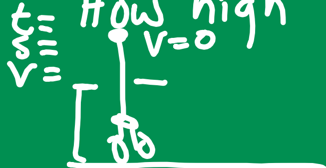
$$h = \frac{1}{2}at^2 + v_0 t + s_0$$

$a = -9.8\ m/s^2$
$a = -32\ ft/s^2$

$$h = \frac{1}{2}(-9.8)t^2 + 50t + 3$$

$$\boxed{\begin{aligned} h &= -4.9t^2 + 50t + 3 \\ v &= -9.8t + 50 \\ a &= -9.8 \end{aligned}}$$

How high will he go?



$$0 = -9.8t + 50$$
$$9.8t = 50$$
$$t \approx 5.102 \text{ sec}$$
$$h = -9.8(5.1)^2 + 50(5.1) + 3$$
$$\approx 130.55 \text{ m}$$

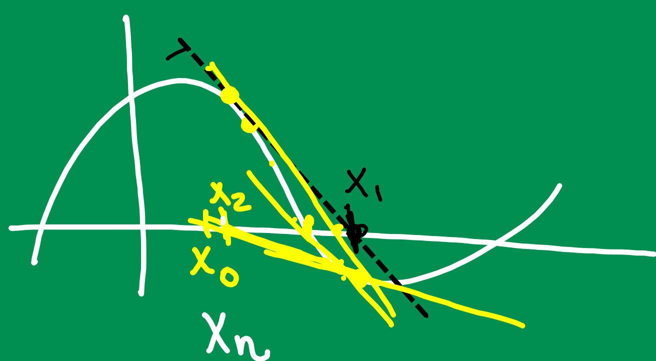
How fast will he be moving when he is 10 m off the ground.

$$10 = -4.9t^2 + 50t + 3$$
$$0 = -4.9t^2 + 50t - 7$$

$$t = \frac{-50 \pm \sqrt{50^2 - 4(-4.9)(-7)}}{2(-4.9)}$$

$$t = 10.06 \text{ sec}$$
$$V = -9.8(10.06) + 50$$
$$\approx -48.58\ m/s$$

Newton's METHOD



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

$$x - \frac{x^3 + x - 1}{3x^2 + 1} \Bigg|_{x=0}$$

Purpose: Solve any equation by finding the x-intercepts.

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

$0 = x^3 - 3x - 1$

$m = f'(x)$

point $= (x_n, f(x_n))$

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

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

$0 - f(x_n) = f'(x_n)(x - x_n)$

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

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

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$$t^2 = \frac{4\pi^2}{Gm}\left(r^3\right)$$

$r = 5.8 \times 10^{10}$ m

$m = 1.99 \times 10^3$ Kg

$$t^2 = \frac{4\pi^2}{(6.67\times10^{-11})(1.99\times10^3)}\left(5.8\times10^{10}\right)^3$$