Completing The Square

$\sqrt{(x+2)^2} = \sqrt{25}$

$x+2 = \pm 5$

$x = -2 \pm 5$

$x = -7 \quad x = 3$

$(x+3)^2 = (x+3)(x+3)$

$= x^2 + 3x + 3x + 9$

$= x^2 + 6x + 9$

$x^2 + 10x + 25 = (x+5)^2$

$10/2 = 5$

$x^2 - 20x + 100 = (x-10)^2$

$-\frac{20}{2} = -10$

$x^2 - 7x + \frac{49}{4} = (x - \frac{7}{2})^2$

$-\frac{7}{2}$

$x^2 - 6x - 1 = 0$

$x^2 - 6x + 9 = 1 + 9$

-3

$\sqrt{(x-3)^2} = \sqrt{10}$

$x - 3 = \pm\sqrt{10}$

$x = 3 \pm \sqrt{10}$

$$\frac{4x^2}{4} + \frac{40x}{4} + \frac{280}{4} = \frac{0}{4}$$

$$x^2 + 10x + 70 = 0$$

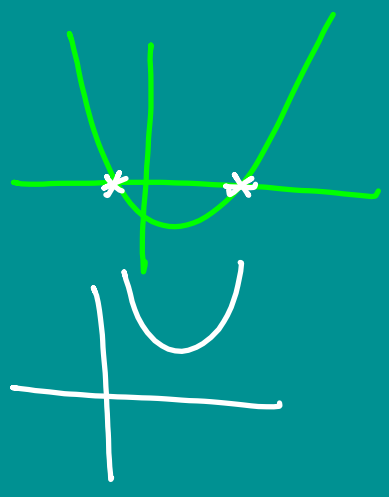
$$x^2 + 10x + 25 = -70 + 25$$

$$\sqrt{(x+5)^2} = \sqrt{-45}$$

$$\sqrt{-1 \cdot 9 \cdot 5}$$

$$x + 5 = \pm 3i\sqrt{5}$$

$$x = -5 \pm 3i\sqrt{5}$$



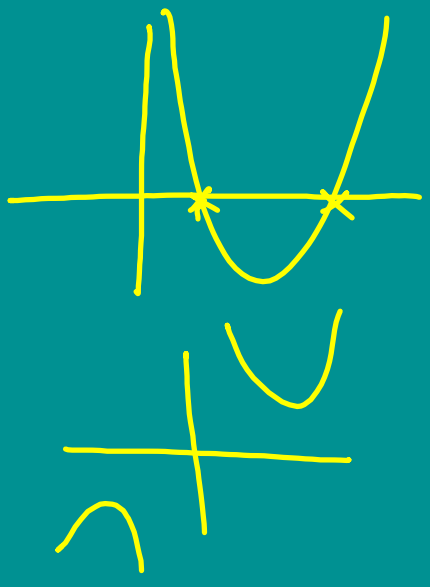
QUADRATIC FORMULA

$\frac{a}{a}x^2 + \frac{b}{a}x + \frac{c}{a} = 0$ $\quad \frac{b}{a}\cdot\frac{1}{2} = \frac{b}{2a}$

$x^2 + \frac{b}{a}x + \frac{c}{a} = 0$

$x^2 + \frac{b}{a}x + \frac{b^2}{4a^2} = -\frac{c}{a} + \frac{b^2}{4ac}$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



$-2x + 4x^2 = 1$

$4x^2 - 2x - 1 = 0$ ($a = 4$, $b = -2$, $c = -1$)

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(4)(-1)}}{2(4)}$$

$$x = \frac{2 \pm \sqrt{4 + 16}}{8}$$

$$= \frac{2 \pm \sqrt{20}}{8}$$ ← y.s

$$= \frac{2 \pm 2\sqrt{5}}{8}$$

$$= \boxed{\frac{1 \pm \sqrt{5}}{4}}$$

$\frac{6 \pm 5i\sqrt{7}}{9}$ ↙ cannot reduce

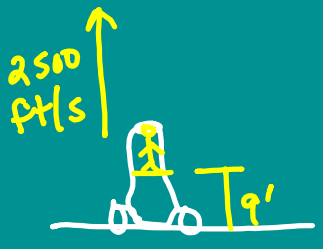
Projectile Motion

$$h(t) = \frac{1}{2}at^2 + V_0 t + S_0$$

- h: height
- t: time
- a: accel. of gravity
- V_0: initial Velocity
- S_0: initial position

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

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



$$h(t) = \frac{1}{2}(-32)t^2 + 2500t + 9$$

$$\boxed{h(t) = -16t^2 + 2500t + 9}$$

Find maximum height.

$x = \frac{-b}{2a}$

$t = \frac{-2500}{2(-16)} = 78.125$ sec

$h(78.125) = -16(78.125)^2 + 2500(78.125) + 9$

$= 97,665.25$ ft.

How long to ground?

Ground $h = 0$

$0 = -16t^2 + 2500t + 9$

$t = \frac{-2500 \pm \sqrt{2500^2 - 4(-16)(9)}}{2(-16)}$

≈ 156.3 sec