12, 19, 23

#12. $h(t) = 5t^2 - 30t + 45$

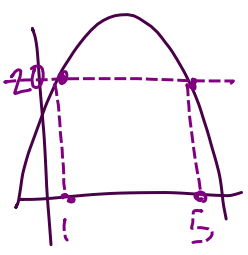
a) set $h(t) = 20$

$20 = 5t^2 - 30t + 45$

$0 = 5t^2 - 30t + 25$

$0 = 5(t^2 - 6t + 5)$ $\quad -5 \cdot -1 = 5$, $-5 + -1 = -6$

$0 = 5(t-5)(t-1)$



$t - 5 = 0$ $\quad t - 1 = 0$

$t = 5$ $\quad t = 1$

19. b) $3(x-2)(x+1) - 4 = 2(x-1)(x-1)$

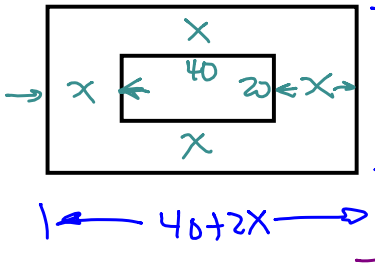
$3(x^2 - x - 2) - 4 = 2(x^2 - 2x + 1)$

$3x^2 - 3x - 10 = 2x^2 - 4x + 2$

$x^2 + x - 12 = 0$

$(x-3)(x+4) = 0$

$x = 3$ $\quad x = -4$



$A_{path} = A_T - A_{flowers}$

$700 = (20+2x)(40+2x) - (20)(40)$

$700 = 800 + 120x + 4x^2 - 800$

$0 = 4x^2 + 120x - 700$

4.3 Solving with Vertex Form

* It is sometimes easier to solve a quadratic equation when it is transformed into vertex form.

* To do so, we must remember that if $x^2 = a$ then... $x = \pm\sqrt{a}$

ex. Solve the following.

a) $x^2 = 13$

$x = \pm\sqrt{13}$

b) $(x-3)^2 - 16 = 0$

$\sqrt{(x-3)^2} = \pm\sqrt{16}$

$x - 3 = \pm 4$

$x - 3 = 4$ $\quad$ $x - 3 = -4$

$x = 7$ $\quad$ $x = -1$

SADMBEP

c) $3(x+5)^2 - 40 = 0$

$\frac{3(x+5)^2}{3} = \frac{40}{3}$

$\sqrt{(x+5)^2} = \pm\sqrt{\frac{40}{3}}$

$x + 5 = \pm\sqrt{\frac{40}{3}}$

$x = -5 \pm \sqrt{\frac{40}{3}}$

$x = -5 + \sqrt{\frac{40}{3}}$ $\quad$ $x = -5 - \sqrt{\frac{40}{3}}$

d) $-2x^2 + 4x + 3 = 0$

convert to vertex form!

$? \cdot ? = -6$

$? + ? = 4$

not factorable

$x = \frac{-b}{2a} = \frac{-4}{2(-2)} = 1$

$f(x) = -2x^2 + 4x + 3$

$f(1) = -2(1)^2 + 4(1) + 3$

$= -2 + 4 + 3$

$= 5$

$(p, q) = (1, 5) \Rightarrow$ vertex

$y = -2(x-1)^2 + 5$

$0 = -2(x-1)^2 + 5$

$\frac{-5}{-2} = \frac{-2(x-1)^2}{-2}$

$\pm\sqrt{\frac{5}{2}} = \sqrt{(x-1)^2}$

$\pm\sqrt{\frac{5}{2}} = x - 1$

$1 \pm \sqrt{\frac{5}{2}} = x$

Ex. blah blah... rocket.. blah blah $h(x) = -0.04x^2 + 2x + 8$, where h = height (m) and x = horizontal distance (m). Where does the rocket land?

we are looking for the zeroes of $h(x)$

→ set $h(x) = 0$

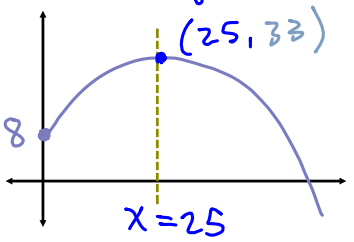
$0 = -0.04x^2 + 2x + 8$

convert to V.F. using

$x = \frac{-b}{2a} = \frac{-2}{2(-0.04)} = 25$

$h(25) = -0.04(25)^2 + 2(25) + 8$

$= 33$



↳ vertex form ⇒ $h(x) = -0.04(x-25)^2 + 33$

Now set $h(x) = 0$ and solve for x

$0 = -0.04(x-25)^2 + 33$

$\frac{-33}{-0.04} = \frac{-0.04(x-25)^2}{-0.04}$

$\pm\sqrt{825} = \sqrt{(x-25)^2}$

$\pm\sqrt{825} = x - 25$

$25 \pm \sqrt{825} = x$

$x = 25 - \sqrt{825}$

$x = -3.7$ ← not useful

since the rocket will only land in the ⊕ direction, I only need to consider...

$x = 25 + \sqrt{825} = \boxed{53.7 \text{ m}}$

∴ the rocket lands 53.7 m from the launch site

Homefun: Pg. 240 #(3-6)ace, 8, 9, 11, 13-17, 19, 15 last

Anywhere it says... complete the square... just convert to vertex form.