

5.5-The Quadratic Formula

Quadratic Formula

If $ax^2 + bx + c = 0$ and $a \neq 0$, then the solutions, or roots, are

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

Axis of Symmetry of a Parabola

If $y = ax^2 + bx + c$, where $a \neq 0$, then the equation for the axis of symmetry

of the parabola is $x = -\frac{b}{2a}$

Use the Quadratic Formula to solve:

$$x^2 - 7x + 6 = 0$$

$$a = 1$$

$$b = -7$$

$$c = 6$$

$$x = \frac{7 \pm \sqrt{(-7)^2 - 4(1)(6)}}{2(1)}$$

$$x = \frac{7 \pm \sqrt{49 - 24}}{2}$$

$$x = \frac{7 \pm \sqrt{25}}{2}$$

$$x = \frac{7 \pm 5}{2}$$

$$x = 6, 1$$

$$2x^2 - 6x = -3$$

$$\begin{array}{r} 2x^2 - 6x = -3 \\ \underline{+3 \quad +3} \\ 2x^2 - 6x + 3 = 0 \end{array}$$

$$a=2 \quad x = \frac{6 \pm \sqrt{(-6)^2 - 4(2)(3)}}{2(2)}$$

$$b=-6$$

$$c=3$$

$$= \frac{6 \pm \sqrt{36 - 24}}{4}$$

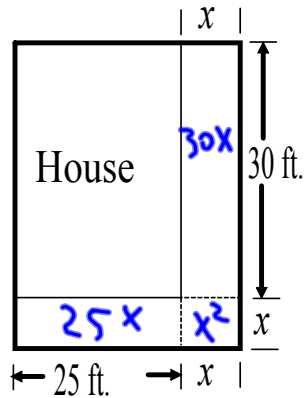
$$= \frac{6 \pm \sqrt{12}}{4}$$

$$= \frac{6 \pm \sqrt{4 \cdot 3}}{4}$$

$$= \frac{6 \pm 2\sqrt{3}}{4}$$

$$x = \frac{3 \pm \sqrt{3}}{2}$$

Sarah decided to build a patio along two sides of her home, as shown below. The patio will have the same width along both sides. Find the width of the patio if Sarah has enough material to cover a surface area of 500 square feet.



$$x^2 + 30x + 25x = 500$$

$$\underline{\quad - 500 \quad - 500 \quad}$$

$$x^2 + 55x - 500 = 0$$

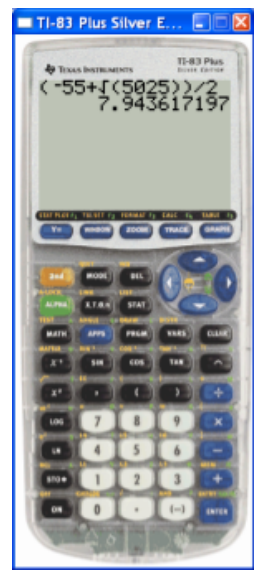
$a = 1$
 $b = 55$
 $c = -500$

$$x = \frac{-55 \pm \sqrt{55^2 - 4(1)(-500)}}{2(1)}$$

$$= \frac{-55 \pm \sqrt{3025 + 2000}}{2}$$

$$= \frac{-55 \pm \sqrt{5025}}{2}$$

$$x = 7.94 \text{ ft.}$$



Write the equation for the axis of symmetry of the graph, and find the coordinates of the vertex.

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

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

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

$$x = 2$$

$$\text{vertex} = (2, -3)$$

Homework

pg. 311-312 #20-26 even #40-46 even #54-58 all

$$P(x) = -.3x^2 + 75x - 2000$$

$$54) x = -\frac{75}{2(-.3)} = 125 \rightarrow \boxed{\$125}$$

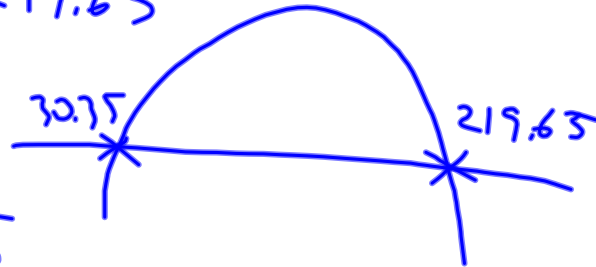
$$55) -.3(125)^2 + 75(125) - 2000 = \boxed{\$2687.50}$$

$$56) -.3x^2 + 75x - 2000 = 0$$

$$\begin{array}{l} a = -.3 \\ b = 75 \\ c = -2000 \end{array} \quad \frac{-75 \pm \sqrt{75^2 - 4(-.3)(-2000)}}{2(-.3)} = \frac{-75 \pm \sqrt{3225}}{-.6}$$

$$x = \$30.35, \$219.65$$

$$57) 30.35 < x < 219.65$$



$$58) x < 30.35$$

$$x > 219.65$$