Homework AGS2 #3.7 Name: Key

The given functions provide the connection between possible areas, $A(x)$, that can be created by a rectangle for a given side length, x, and a set amount of perimeter. You could think of it as the different amounts of area you can close in with a given amount of fencing as long as you always create a rectangular enclosure.

1. $A(x) = x(10 - x)$

Find the following:

a. A(3) = $3(10-3) = 3(7) = 21$

b. A(4) = $4(10-4) = 4(6) = 24$

c. A(6) = $6(10-6) = 6(4) = 24$

d. Solve: A(x) = 0

$0 = x(10-x)$

$\boxed{x=0 \quad x=10}$

2. $A(x) = x(50 - x)$

Find the following:

a. A(10) = $10(50-10) = 10(40) = 400$

b. A(20) = $20(50-20) = 20(30) = 600$

c. A(30) = $30(50-30) = 30(20) = 600$

d. Solve: A(x) = 0

$0 = x(50-x)$

$\boxed{x=0 \quad x=50}$

For #3 – 8 solve. Choose between completing the square, factoring, and quadratic formula. Use each method at least once. State the method you are using, show work, and find the solution(s).

3. $x^2 + 17x + 60 = 0$

factoring

$a \cdot c = 60$	$b = 17$
$1 \cdot 60$	61
$2 \cdot 30$	32
$3 \cdot 20$	23
$4 \cdot 15$	19
$\boxed{5 \cdot 12}$	$\boxed{17}$

$(x+5)(x+12) = 0$

$\boxed{x=-5 \quad x=-12}$

4. $x^2 + 16x + 39 = 0$

Quadratic formula

$a=1$
$b=16$
$c=39$

$x = \dfrac{-(16) \pm \sqrt{(16)^2 - 4(1)(39)}}{2(1)}$

$x = \dfrac{-16 \pm \sqrt{256-156}}{2}$

$x = \dfrac{-16 \pm \sqrt{100}}{2}$

$x = \dfrac{-16 \pm 10}{2}$

$x = \dfrac{-16+10}{2} = -3$

$x = \dfrac{-16-10}{2} = -13$

Completing the Square + $\sqrt{\ }$ method

5. $x^2 + 7x - 5 = 0$

$x^2 + 7x + \frac{49}{4} - 5 - \frac{49}{4} = 0$

$\left(\frac{b}{2}\right)^2 = \left(\frac{7}{2}\right)^2 = \frac{49}{4}$

$\left(x + \frac{7}{2}\right)^2 - \frac{20}{4} - \frac{49}{4} = 0$

$(x + 7/2)^2 - 69/4 = 0$

$+69/4 \quad +69/4$

$\sqrt{(x + 7/2)^2} = \pm\sqrt{69/4}$

$x + 7/2 = \pm\sqrt{69/4}$

$-7/2 \quad -7/2$

$x = -7/2 \pm \frac{\sqrt{69}}{2}$

$\boxed{x = \frac{-7 \pm \sqrt{69}}{2}}$

QF

6. $3x^2 + 14x - 5 = 0$

$a = 3$
$b = 14$
$c = -5$

$x = \frac{-(14) \pm \sqrt{(14)^2 - 4(3)(-5)}}{2(3)}$

$x = \frac{-14 \pm \sqrt{256}}{6}$

$x = \frac{-14 \pm 16}{6}$

$x = \frac{-14+16}{6} = \frac{1}{3}$

$x = \frac{-14-16}{6} = -5$

QF

7. $x^2 - 12x = -8$ $\quad +8 \quad +8$ $\quad x^2 - 12x + 8 = 0$

$a = 1$
$b = -12$
$c = 8$

$x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(1)(8)}}{2(1)}$

$x = \frac{12 \pm \sqrt{144 - 32}}{2}$

$\sqrt{112}$: $2 \cdot 56$, $2 \cdot 28$, $2 \cdot 14$, $2 \cdot 7$

$x = \frac{12 \pm \sqrt{112}}{2} = \frac{12 \pm 4\sqrt{7}}{2}$

$\boxed{x = 6 \pm 2\sqrt{7}}$

QF

8. $x^2 + 6x = 7$

$-7 \quad -7$

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

$a = 1$
$b = 6$
$c = -7$

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

$x = \frac{-6 \pm \sqrt{36 + 28}}{2}$

$x = \frac{-6 \pm \sqrt{64}}{2}$

$x = \frac{-6 \pm 8}{2}$

$x = \frac{-6+8}{2} = 1$

$x = \frac{-6-8}{2} = -7$

Summarize the process for solving a quadratic by the indicated strategy. Give examples along with written explanation, also indicate when it is best to use this strategy.

11. Completing the Square best used when $a = 1$ (or all #s a,b,c divisible by a). easiest when equation is already in vertex form.

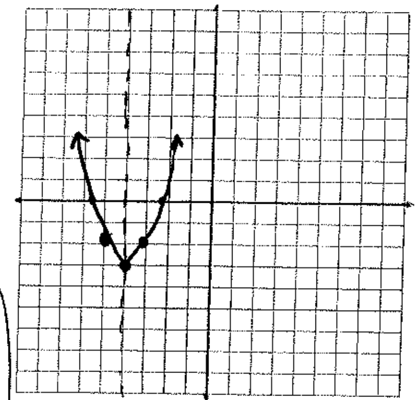
12. Factoring when $a = 1$

13. Quadratic Formula when $a \neq 1$ and factoring doesn't work or #s a,b,c are odd

Hint: Put each of these in vertex form first.

Graph the quadratic function and supply the desired information about the graph.

14. $f(x) = x^2 + 8x + 13$



a. Line of symmetry: $x = -4$

b. x-intercepts: $x = -4 \pm \sqrt{3}$

c. y-intercept: $(0, 13)$

d. vertex: $f(x) = x^2 + 8x + \underline{16} + 13 - \underline{16}$

$\boxed{(-4, -3)}$

$\boxed{f(x) = (x+4)^2 - 3}$

$\left(\frac{b}{2}\right)^2 = \left(\frac{8}{2}\right)^2 = (4)^2 = 16$

$0 = (x+4)^2 - \cancel{3}$

$+3 \qquad \cancel{+3}$

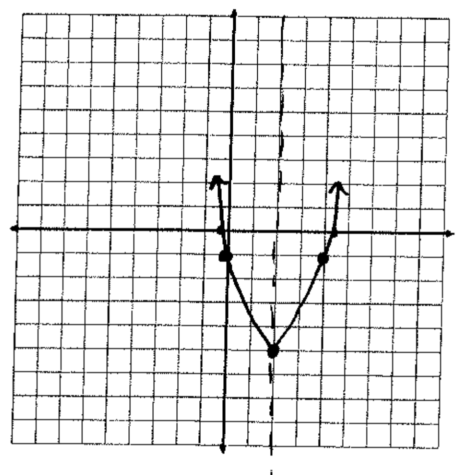
$\pm\sqrt{3} = \sqrt{(x+4)^2}$

$x + 4 = \pm\sqrt{3}$

$-4 \quad -4$

$\boxed{x = -4 \pm \sqrt{3}}$ ≈ -2.27 and -5.73

15. $f(x) = x^2 - 4x - 1$



a. Line of symmetry: $x = +2$

b. x-intercepts: $2 \pm \sqrt{5}$

c. y-intercept: $(0, -1)$

d. vertex: $f(x) = x^2 - 4x + \underline{4} - 1 - \underline{4}$

$\boxed{(2, -5)}$

$\left(\frac{b}{2}\right)^2 = \left(\frac{-4}{2}\right)^2 = (-2)^2 = 4$

$\boxed{f(x) = (x-2)^2 - 5}$

$0 = (x-2)^2 - \cancel{5}$

$+5 \qquad \cancel{+5}$

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

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

$+2 \quad +2$

$\boxed{x = 2 \pm \sqrt{5}}$ ≈ 4.24 and -0.24