1-10 HW Answer Key

1 & 2. Look at next page

3. $5\sqrt{3}$
4. -22
5. $2\sqrt{7}$
6. $\sqrt{14}$
7. $\sqrt{3}$
8. $3\sqrt{2}$
9. 64, 8
10. 16, 4
11. 48, $4\sqrt{3}$
12. 117, $3\sqrt{13}$
13. $3x(2x-5)(x+2)$
14. $\{0, 5, -2\}$
15. $(2x+5)(4x^2-10x+25)$

1. Justify that $\sqrt{a} \bullet \sqrt{b} = \sqrt{ab}$ by letting a=25 and b=4.

$\sqrt{25} \cdot \sqrt{4} \stackrel{?}{=} \sqrt{25 \cdot 4}$

$5 \cdot 2 = \sqrt{100}$

$10 = 10$ ✓

2. Justify that $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$ by letting a=100 and b=4.

$\sqrt{\frac{100}{4}} \stackrel{?}{=} \frac{\sqrt{100}}{\sqrt{4}}$

$\sqrt{25} = \frac{10}{2}$

$5 = 5$ ✓

Express in simplest radical form.

3. $\sqrt{75} = \sqrt{25}\sqrt{3}$

$= 5\sqrt{3}$

4. $-2\sqrt{121}$

$= -2(11)$

$= -22$

5. $\frac{\sqrt{56}}{\sqrt{2}} = \sqrt{28}$

$= \sqrt{4}\sqrt{7}$

$= 2\sqrt{7}$

6. $\frac{\sqrt{56}}{2}$

$= \frac{\sqrt{4}\sqrt{14}}{2}$

$= \frac{2\sqrt{14}}{2}$

$= \sqrt{14}$

7. $\sqrt{\frac{36}{12}}$

$= \sqrt{3}$

8. $\frac{3}{4}\sqrt{32}$

$= \frac{3}{\cancel{4}} \cancel{\sqrt{16}}^{4} \sqrt{2}$

$= 3\sqrt{2}$

b^2-4ac

Find the discriminant and then take its square root.

9. $5x^2 + 2x - 3 = 0$

$b^2-4ac = (2)^2-4(5)(-3)$
$= 4 + 60$
$= 64$
$\sqrt{64} = 8$

10. $3x^2 - 10x + 7 = 0$

$b^2-4ac = (-10)^2-4(3)(7)$
$= 100 - 84 = 16$
$\sqrt{16} = 4$

11. $2x^2 - 4x = 4$

$2x^2-4x-4=0$
$b^2-4ac = (-4)^2-4(2)(-4)$
$= 16 + 32 = 48$
$\sqrt{48} = \sqrt{16}\sqrt{3} = 4\sqrt{3}$

12. $9x^2 + 3x = 3$

$9x^2+3x-3=0$
$b^2-4ac = 3^2-4(9)(-3)$
$= 9 + 108 = 117$
$\sqrt{117} = \sqrt{9}\sqrt{13} = 3\sqrt{13}$

13. Factor completely: $6x^3 - 3x^2 - 30x$ $= 3x(2x^2 - x - 10)$
$= 3x[2x^2 - 5x + 4x - 10]$
$= 3x[x(2x-5) + 2(2x-5)]$
$= 3x(2x-5)(x+2)$

$p = -20$
$s = -1$
$-5, 4$

14. Solve by factoring: $3x^3 - 9x^2 = 30x$

$3x^3 - 9x^2 - 30x = 0$
$3x(x^2 - 3x - 10) = 0$
$3x(x-5)(x+2) = 0$
$x=0 \;/\; x=5 \;/\; x=-2$ $\{0, 5, -2\}$

$p = -10$
$s = -3$
$-5, 2$

15. Factor and check: $8x^3 + 125$.

$8x^3+125 = (2x+5)(4x^2-10x+25)$

check $(2x+5)(4x^2-10x+25)$
$= 8x^3 - 20x^2 + 50x + 20x^2 - 50x + 125$
$= 8x^3 + 125$ ✓

1-11: Solve Quadratic Equations Using the Quadratic Formula

If we have a quadratic equation that is not easily factorable, we can solve it by using the quadratic formula. Try solving this by factoring: $3x^2 + 5x - 1 = 0$

What do you notice?

D.N.F.

$P = 3(-1) = -3$

$S = 5$

no magic #'s

The Quadratic Formula

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

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

https://www.youtube.com/watch?v=2lbABbfU6Zc (To music)

http://www.youtube.com/watch?v=O8ezDEk3qCg

http://www.youtube.com/watch?v=z6hCu0EPs-o

You should recognize the expression under the radical = $b^2 - 4ac$.

We call that the discriminant and will find it first.

Let's use the quadratic formula to solve the following equation. Find the discriminant first.

1. $3x^2 + 5x - 1 = 0$ (a = 3, b = 5, c = −1)

$D = b^2 - 4ac = 25 - 4(3)(-1) = 37$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-5 \pm \sqrt{37}}{2(3)} = \frac{-5 \pm \sqrt{37}}{6}$$

Find the zeros of the functions or the roots of the equations using the quadratic formula. Leave all solutions in simplest radical form.
Note: Some can be solved by factoring, but we will use the quadratic formula.

2. $f(x) = x^2 + 8x + 7$

$0 = \overset{a=1}{x^2} + \overset{b}{8}x + \overset{c}{7}$

$b^2 - 4ac = 64 - 4(1)(7)$
$= 64 - 28$
$= 36$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-8 \pm \cancel{\sqrt{36}}^{\,6}}{2(1)} = \frac{-8 \pm 6}{2}$

$x_1 = \frac{-8-6}{2} = -7$

$x_2 = \frac{-8+6}{2} = -1$

$\{-1, -7\}$

3. $-9 = x^2 + 6x$

$0 = x^2 + 6x + 9$ $a=1$, $b=6$, $c=9$

$b^2 - 4ac = 36 - 4(1)(9) = 0$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-6 \pm \cancel{\sqrt{0}}^{\,0}}{2(1)} = \frac{-6}{2} =$

$\{-3\}$

4. $3(x-2)^2-4=0$

$(x-2)^2=(x-2)(x-2)$

x^2-4x+4

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

$3x^2-12x+12-4=0$

$3x^2-12x+8=0$

$a=3$
$b=-12$
$c=8$

$b^2-4ac=144-4(3)(8)$
$=144-96$
$=48$

$x=\frac{12\pm\sqrt{48}}{2(3)}=\frac{12\pm\overset{4}{\sqrt{16}}\sqrt{3}}{6}=\frac{12\pm4\sqrt{3}}{6}\div2$

$=\frac{6\pm2\sqrt{3}}{3}$

5. $f(x)=2x^2-16x+27$

You can use the quadratic formula to solve real-world problems modeled by quadratic functions.

6. In a shot put event, Jenna tosses her last shot from a position of about 6' above the ground with an initial vertical and horizontal velocity of 20 ft/sec. The height of the shot is modeled by the function $h(t) = -16t^2 + 20t + 6$, where t is the time in seconds after the toss. How long does it take the shot to reach the ground? Round to the nearest tenth.

$h(t) = 0$

$0 = -16t^2 + 20t + 6$ $\quad a = -16$, $b = 20$, $c = 6$

$b^2 - 4ac = 400 - 4(-16)(6) =$
$= 400 + 384 = 784$

$t = \frac{-20 \pm \sqrt{784}}{2(-16)} = \frac{-20 \pm 28}{-32}$ $\quad$ 1.5 sec

$t_1 = \frac{-20-28}{-32} = 1.5$ sec

$t_2 = \frac{-20+28}{-32} = \cancel{-.25 \text{ sec}}$ reject