## 1-9 HW Answer Key

2. $(2x+3)(x-2)(x+2)$
3. $x^2(3x-2)(3x-2)$
4. $\{1/2\}$
5. $\{3/2, -4\}$
6. $\{-2, \pm 1\}$
7. $\{0, 5, 2\}$
8. $\{0, \pm\sqrt{3}, \pm\sqrt{5}\}$
9. $\{\pm 3\}$
10. $\{\pm 2, \pm 5\}$
11. $(2x-5)(4x^2+10x+25)$

1. Roots and zeros are similar in that they both refer to the same point graphically where the function or related function crosses the x-axis. They are different in that roots are algebraic solutions to a given equation or an equation formed by setting the function equal to zero. Zeros are where the function crosses the x-axis (x-intercepts) or where the y value is zero.

1. Explain what is similar and what is different between roots and zeros.

Roots and zeros are similar because they both refer to the same point graphically where the function or related function crosses the x-axis. They are different because roots are algebraic solutions to a given equation or an equation formed by setting the function equal to zero & zeros are where the function crosses the x-axis (x-intercepts) or where $y = 0$.

**Factor Completely**

2. $2x^3 + 3x^2 - 8x - 12$

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

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

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

3. $9x^4 - 12x^3 + 4x^2$ $\quad p = 36$, $s = -12$, $-6, -6$

$= x^2(9x^2 - 12x + 4)$

$= x^2[9x^2 - 6x - 6x + 4]$

$= x^2[3x(3x-2) - 2(3x-2)]$

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

or $x^2(3x-2)^2$

For the following:

a) Algebraically find the zeros of the function.

b) Check graphically on your calculator by sketching the function and labeling the x-intercepts/zeros.

c) Check algebraically by substituting your solutions into the equation.

4a. $f(x) = 4x^2 - 4x + 1$ $\quad p = 4$, $s = -4$, $-2, -2$

$4x^2 - 4x + 1 = 0$

$4x^2 - 2x - 2x + 1 = 0$

$2x(2x-1) - 1(2x-1) = 0$

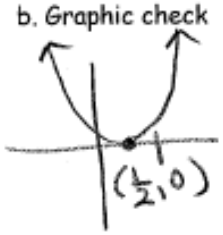
$(2x-1)(2x-1) = 0$

$2x - 1 = 0 \mid x = 1/2$

$2x = 1$

$x = 1/2$ $\quad \{\frac{1}{2}\}$

b. Graphic check




c. Algebraic check

$4(\frac{1}{2})^2 - 4(\frac{1}{2}) + 1 = 0$

$4(\frac{1}{4}) - 2 + 1 = 0$

$1 - 2 + 1 = 0$

$0 = 0$ ✓

5a. $f(x) = 2x^2 + 5x - 12$ $\quad p = -24$, $s = 5$, $8, -3$

$2x^2 + 5x - 12 = 0$

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

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

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

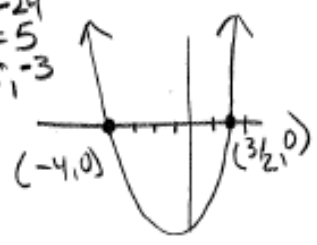
$x + 4 = 0 \mid 2x - 3 = 0$

$x = -4 \mid 2x = 3$

$x = 3/2$

$\{3/2, -4\}$

b. Graphic check




c. Algebraic check

$2(-4)^2 + 5(-4) - 12 = 0$

$32 - 20 - 12 = 0$

$0 = 0$ ✓

$2(3/2)^2 + 5(3/2) - 12 = 0$

$2(9/4) + 15/2 - 12 = 0$

$\frac{24}{2} - 12 = 0$

$12 - 12 = 0$

$0 = 0$ ✓

6a. $f(x) = x^3 + 2x^2 - x - 2$

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

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

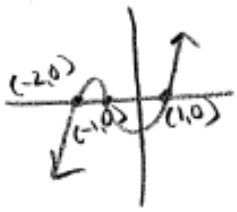
$(x+2)(x^2-1)=0$

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

$x=-2 \mid x=-1 \mid x=1$

$\{-2, \pm 1\}$

b. Graphic check




c. Algebraic check

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

$-8+8+2-2=0$

$0=0$ ✓

$(1)^3+2(1)^2-(1)-2=0$

$1+2-1-2=0$

$0=0$ ✓

$(-1)^3+2(-1)^2-(-1)-2=0$

$-1+2+1-2=0$

$0=0$ ✓

Find the zeros of the following functions by factoring. No checks.

7. $f(x) = 3x^6 - 21x^5 + 30x^4$

$3x^6-21x^5+30x^4=0$

$3x^4(x^2-7x+10)=0$

$3x^4(x-5)(x-2)=0$

$3x^4=0 \mid x=5 \mid x=2$

$x=0$

$\{0, 5, 2\}$

$P=10$

$S=-7$

$-5, -2$

8. $f(m) = m^5 - 8m^3 + 15m$

$m^5-8m^3+15m=0$

$m(m^4-8m^2+15)=0$

$m(m^2-3)(m^2-5)=0$

$m=0 \mid m^2-3=0 \mid m^2-5=0$

$m^2=3 \quad m^2=5$

$m=\pm\sqrt{3} \quad m=\pm\sqrt{5}$

$\{0, \pm\sqrt{3}, \pm\sqrt{5}\}$

$P=15$

$S=-8$

$-3, -5$

Find the roots of the following equations by factoring. No checks.

9. $3x^2 = 27$

$3x^2-27=0$

$3(x^2-9)=0$

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

$x=-3 \mid x=3$

$\{\pm 3\}$

10. $x^4+100 = 29x^2$

$x^4-29x^2+100=0$

$(x^2-25)(x^2-4)=0$

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

$x=-5 \mid x=5 \mid x=-2 \mid x=2$

$\{\pm 5, \pm 2\}$

$P=100$

$S=-29$

$-25, -4$

11. Factor and check: $8x^3 - 125$.

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

check $(2x-5)(4x^2+10x+25)$

$= 8x^3+20x^2+50x-20x^2-50x-125$

$= 8x^3-125$ ✓

## 1-10: Simplify Square Roots And Find The Discriminant

No calculator use. Complete and get familiar with this table.

| Integer | Square | Integer | Square |
|---|---|---|---|
| 1 | 1 | 11 | 121 |
| 2 | 4 | 12 | 144 |
| 3 | 9 | 13 | 169 |
| 4 | 16 | 14 | 196 |
| 5 | 25 | 15 | 225 |
| 6 | 36 | 16 | 256 |
| 7 | 49 | 17 | 289 |
| 8 | 64 | 20 | 400 |
| 9 | 81 | 25 | 625 |
| 10 | 100 | 30 | 900 |

$\sqrt[n]{x}$

n → index
x → radicand
$\sqrt{\ }$ → radical

Properties (true for all indices)

$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$

$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

## SIMPLIFY SQUARE ROOTS

Write each of the following numbers in simplest radical form:

1. $\sqrt{24} = \sqrt{4}\cdot\sqrt{6} = 2\sqrt{6}$

2. $\sqrt{16} = 4$

3. $\frac{\sqrt{54}}{\sqrt{2}} = \sqrt{\frac{54}{2}} = \sqrt{27} = \sqrt{9}\sqrt{3} = 3\sqrt{3}$

4. $\sqrt{\frac{1}{225}} = \frac{\sqrt{1}}{\sqrt{225}} = \frac{1}{15}$

5. $\sqrt{\frac{72}{24}} = \sqrt{3}$

6. $\frac{2}{3}\sqrt{27} = \frac{2}{3}\sqrt{9}\sqrt{3} = 2\sqrt{3}$

7. $\sqrt{21}$

8. $-2\sqrt{48} = -2\sqrt{16}\sqrt{3}$

$-8\sqrt{3}$

9. $5\sqrt{16} = 20$

10. $\sqrt{\frac{81}{16}} = \frac{\sqrt{81}}{\sqrt{16}} = \frac{9}{4}$

## FIND THE DISCRIMINANT

We know that standard form of a quadratic equation is $ax^2+bx+c=0$

The discriminant is a number formed from standard form of a quadratic equation and equal to $b^2-4ac$. (part under radical in quadratic formula)

Find the discriminant.

11. $x^2 - 3x + 2 = 0$

$a=1 \quad b=-3 \quad c=2$

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

$D = 9-8$

$D = 1$

12. $3x^2 - 5x + 1 = 0$

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

$D = 25-12$

$D = 13$

13. $4x^2 - 4x = -1$

$4x^2 - 4x + 1 = 0$

$D = b^2 - 4ac = 16 - 4(4)(1)$

$D = 16 - 16$

$D = 0$

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

$x^2 - 7 = 0$

$a = 1$ $b = 0$ $c = -7$

$D = 0 - 4(1)(-7)$

$D = 0 + 28$

$D = 28$

15. $x^2 - 6x + 9 = 0$

16. $2x^2 + 4x = 1$

Simplify the square root of each discriminant in the previous section.

11. $\sqrt{1} = 1$

12. $\sqrt{13}$

13. $\sqrt{0} = 0$

14. $\sqrt{28} = \sqrt{4}\sqrt{7} = 2\sqrt{7}$

15.

16.