1-8 HW Answer Key

1. Either x=0 or y=0.
2. {3}
3. {2}
4. {0, 9}
5. $\left\{\pm\frac{7}{3}\right\}$
6. {0, ±5}
7. {6, 1}
8. {2, 1/2}
9. {±2, ±4}
10. {±2, -3}
11. $f(x)=x^2-x-6$
12. {7}
13. $(3x+4)(9x^2-12x+16)$
14. $21x^2+2xy-8y^2$

1. If xy=0, what can you say about x and/or y.

Either $x=0, y=0$ or both are zero.

Find the roots of each equation by factoring.

Short PIS

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

$x^2-6x+9=0$ $P=9$ $S=-6$ $-3,-3$

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

$x-3=0 \mid x=3$

$x=3$

$\{3\}$

GCF/Short PIS

3. $5x^2 + 20 = 20x$

$\frac{5x^2-20x+20=0}{5}$

$x^2-4x+4=0$ $P=4$ $S=-4$ $-2,-2$

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

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

$x=2$

$\{2\}$

GCF

4. $m^3 - 9m^2 = 0$

$m^2(m-9)=0$

$m^2=0 \mid m-9=0$

$m=0 \mid m=9$

$\{0,9\}$

ROOTS

5. $9x^2 = 49$

$9x^2-49=0$

$(3x-7)(3x+7)=0$

$3x-7=0 \mid 3x+7=0$

$3x=7 \mid 3x=-7$

$x=7/3 \mid x=-7/3$

$\{\pm 7/3\}$

GCF/ROOTS

6. $4x^3 - 100x = 0$

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

$4x(x+5)(x-5)=0$

$4x=0 \mid x+5=0 \mid x-5=0$

$x=0 \mid x=-5 \mid x=5$ $\{0,\pm 5\}$

Find the zeros of each function by factoring.

Short PIS

7. $f(x) = x^2 - 7x + 6$

$x^2-7x+6=0$ $P=6$ $S=-7$ $-1,-6$

$(x-6)(x-1)=0$

$x-6=0 \mid x-1=0$

$x=6 \mid x=1$

$\{1,6\}$

Long PIS

8. $g(x) = 2x^2 - 5x + 2$

$2x^2-5x+2=0$ $P=4$ $S=-5$ $-4,-1$

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

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

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

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

$x=2 \mid 2x=1$

$x=1/2$

$\{2, 1/2\}$

Short PIS/ZOTS

9. $f(t) = t^4 - 20t^2 + 64$

$t^4 - 20t^2 + 64 = 0$

$p = 64$, $s = -20$, $-4, -16$

$(t^2 - 4)(t^2 - 16) = 0$

$(t+2)(t-2)(t+4)(t-4) = 0$

$t+2=0$ | $t-2=0$ | $t+4=0$ | $t-4=0$

$t=-2$ | $t=2$ | $t=-4$ | $t=4$

$\{\pm 2, \pm 4\}$

Grouping DOTS

10. $g(x) = x^3 + 3x^2 - 4x - 12$

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

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

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

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

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

$x=-3$ | $x=-2$ | $x=2$

$\{\pm 2, -3\}$

11. Write a quadratic function in standard form with zeros 3 and -2.

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

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

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

$f(x) = x^2 - x - 6$

12. What is the solution of $(y-7)^{28} = 0$?

$(y-7)(y-7)\ldots = 0$

$y=7$ | $y=7$

$\{7\}$

13. Factor $27x^3 + 64$. $= (3x+4)(9x^2 - 12x + 16)$

$a = 3x$

$b = 4$

14. Simplify $(7x - 4y)(3x + 2y)$.

$= 21x^2 + 14xy - 12xy - 8y^2$

$= 21x^2 + 2xy - 8y^2$

1-9: More Finding Roots And Zeros

Warm-up: Can you correctly complete the following statement without looking at yesterday's notes? Check with a neighbor before checking yesterday's notes.

Functions have zeros or x-intercepts, while
equations have roots or solutions

Explain the special role of the number zero in factoring and solving an equation.

We can find the solution of any equation that equals zero and that can be factored by setting each factor equal to zero and solving for x.

Zeros, Roots and X-Intercepts

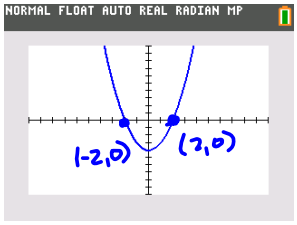
1a. Graph $f(x) = x^2 - 4$ on your calculator.

The x-intercepts are where the function crosses the x-axis.

How many of them are there? 2

State them as full points. (-2,0), (2,0)

Sketch the function to the side and label the x-intercepts.



b. These are also the zeros of the function.

Find the zeros graphically on your calculator by using 2nd-Trace-Zero(2).

The zeros are ±2 and are at the same point as the x-intercepts.

The zeros or x-intercepts always have the same y-coordinate of 0.

Integer value zeros can be seen in your calculator table by looking for y = 0.

c. Algebraically find the zeros of this same function by factoring means:

We set f(x) or y equal to 0.

Then we find the zeros by factoring and solving the equation to find the roots.

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

$0 = x^2 - 4$

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

$x-2=0 \quad | \quad x+2=0$

$x=2 \quad | \quad x=-2$

$\{\pm 2\}$

d. We've already checked our zeros graphically by sketching and labeling above.

Check your zeros algebraically by substituting them into the equation in part c.

$0 = (2)^2 - 4$

$0 = 4 - 4$

$0 = 0$ ✓

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

$0 = 4 - 4$

$0 = 0$ ✓

$(-2)^2 \neq -2^2$

$4 \neq -4$

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.

2a. $f(x) = 2x^2 + x - 15$

$0 = 2x^2 + x - 15$ $\quad p = -30$, $s = 1$, $6, -5$

$0 = 2x^2 + 6x - 5x - 15$

$0 = 2x(x+3) - 5(x+3)$

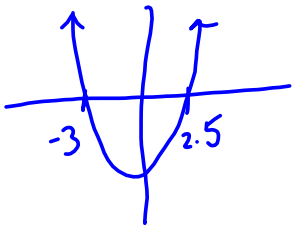
$0 = (x+3)(2x-5)$

$x+3=0$ | $2x-5=0$

$x = -3$ | $2x = 5$, $x = 5/2$

$\{-3, 5/2\}$

b. Graphic check



c. Algebraic check

$0 = 2(-3)^2 + (-3) - 15$

$0 = 0$ ✓

$0 = 2(5/2)^2 + 5/2 - 15$

$0 = 0$ ✓

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

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

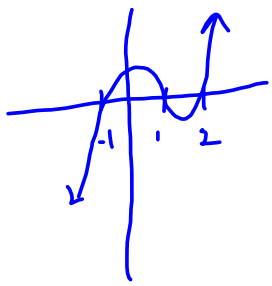
$0 = x^2(x-2) - 1(x-2)$

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

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

$x = 2$ | $x = 1$ | $x = -1$

b. Graphic check



c. Algebraic check

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

$0 = 0$ ✓

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

$0 = 0$ ✓

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

$0 = 0$ ✓

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

4. $4x^2 = 36$

$\frac{4x^2-36}{4} = \frac{0}{4}$

$x^2-9=0$

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

$x+3=0 \quad | \quad x-3=0$

$x=-3 \quad | \quad x=3$

$\{\pm 3\}$

5. $4x^2 = 7$

$4x^2-7=0$

$(2x+\sqrt{7})(2x-\sqrt{7})=0$ yuck!

$2x+\sqrt{7}=0 \quad | \quad 2x-\sqrt{7}=0$

$\frac{2x}{2}=\frac{-\sqrt{7}}{2} \quad | \quad \frac{2x}{2}=\frac{\sqrt{7}}{2}$

$x=-\frac{\sqrt{7}}{2} \quad | \quad x=\frac{\sqrt{7}}{2}$ $\left\{\pm\frac{\sqrt{7}}{2}\right\}$

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

6. $f(x) = 4x^7 - 28x^6 + 48x^5$

$0 = 4x^7 - 28x^6 + 48x^5$

$0 = 4x^5(x^2-7x+12)$ $P=12$ $S=-3$ $-3,-4$

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

$4x^5=0 \quad | \quad x-3=0 \quad | \quad x-4=0$

$x^5=0 \quad | \quad x=3 \quad | \quad x=4$

$x=0$

$\{0,3,4\}$

7. $f(t) = t^5 - 10t^3 + 21t$

$0 = t^5 - 10t^3 + 21t$

$0 = t(t^4-10t^2+21)$ $P=21$ $S=-10$ $-3,-7$

$0 = t(t^2-3)(t^2-7)$

$t=0 \quad | \quad t^2-3=0 \quad | \quad t^2-7=0$

$\sqrt{t^2}=\sqrt{3} \quad | \quad \sqrt{t^2}=\sqrt{7}$

$t=\pm\sqrt{3} \quad | \quad t=\pm\sqrt{7}$

$\{0, \pm\sqrt{3}, \pm\sqrt{7}\}$