1-6 HW Answer Key

1. See next page
2. See next page
3. $(x+3)(x^2-3x+9)$
4. $(x-3)(x^2+3x+9)$
5. $(2+x)(4-2x+x^2)$
6. $(2-x)(4+2x+x^2)$
7. $(2x-1)(\underline{4x^2}+2x+1)$
8. $(x-9)(x+5)$
9. $(5x-2)(3x+1)$
10. $(x^2+1)(5x+2)$
11. $4x^2(x+1)(x-2)$
12. $3a(3a+b)(3a-b)$

1 GCF first!!!

2 2 Terms
- DOTS
- Sum/Diff Cubes

3 3 Terms
- Prod/Sum
  Long $a \neq 1$
  Short $a = 1$

4 4 terms
- Grouping

1. Justify that $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$ by simplifying the right side.

$$a^3+b^3 = a(a^2-ab+b^2)+b(a^2-ab+b^2)$$
$$a^3+b^3 = a^3 \cancel{-a^2b} \cancel{+ab^2} \cancel{+a^2b} \cancel{-ab^2} + b^3$$
$$a^3+b^3 = a^3+b^3 \checkmark$$

2. **Prove** that $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$ by simplifying the right side.

$$a^3-b^3 = a(a^2+ab+b^2)-b(a^2+ab+b^2)$$
$$a^3-b^3 = a^3 \cancel{+a^2b} \cancel{+ab^2} \cancel{-a^2b} \cancel{-ab^2} - b^3$$
$$a^3-b^3 = a^3-b^3$$

Factor and check **#s 3 and 6.**

3. $x^3 + 27 = (x+3)(x^2-3x+9)$

$a=x$
$b=3$

check
$(x+3)(x^2-3x+9)$
$= x^3 \cancel{-3x^2} \cancel{+9x} \cancel{+3x^2} \cancel{-9x} + 27$
$= x^3+27 \checkmark$

4. $x^3 - 27 = (x-3)(x^2+3x+9)$

$a=x$
$b=3$

check
$(x-3)(x^2+3x+9)$
$= x^3 \cancel{+3x^2} \cancel{+9x} \cancel{-3x^2} \cancel{-9x} - 27$
$= x^3-27 \checkmark$

5. $8 + x^3 = (2+x)(2^2-2x+x^2)$
$= (2+x)(4-2x+x^2)$

$a=2$
$b=x$

check
$(2+x)(4-2x+x^2)$
$= 8 \cancel{-4x} \cancel{+2x^2} \cancel{+4x} \cancel{-2x^2} + x^3$
$= 8+x^3 \checkmark$

6. $8 - x^3 = (2-x)(2^2+2x+x^2)$
$= (2-x)(4+2x+x^2)$

$a=2$
$b=x$

check
$(2-x)(4+2x+x^2)$
$= 8 \cancel{+4x} \cancel{+2x^2} \cancel{-4x} \cancel{-2x^2} - x^3$
$= 8-x^3$

Factor completely.

7. $8x^3 - 1 = (2x-1)((2x)^2 + 2x + 1)$

$a = 2x \quad = (2x-1)(4x^2+2x+1)$

$b = 1$

8. $x^2 - 4x - 45$ $P=-45, S=-4$

$= (x-9)(x+5)$ $-9, 5$

9. $15x^2 - x - 2$ $P=-30, S=-1$

$5, -6$

$= \underline{15x^2-6x} + \underline{5x-2}$

$= 3x(5x-2) + 1(5x-2)$

$= (5x-2)(3x+1)$

10. $\underline{5x^3 + 5x} + \underline{2x^2 + 2}$

$= 5x(x^2+1) + 2(x^2+1)$

$= (x^2+1)(5x+2)$

11. $4x^4 - 4x^3 - 8x^2$

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

$S=-1$

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

12. $27a^3 - 3ab^2$

$= 3a(9a^2-b^2)$

$= 3a(3a+b)(3a-b)$

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Go to HW 1-7 and cross it out.
We are omitting notes and
homework for 1-7.

1-8: Solve Quadratic Equations by Factoring

Vocabulary Tip: Functions have zeros or x-intercepts, while equations have solutions or roots.

We can find the roots of a quadratic equation in the form $ax^2 + bx + c = 0$ by factoring.

If ab=0, then what do you know about a or b? Why?

$a = 0$ or $b = 0$ (or both)

anything mult. by zero equals zero

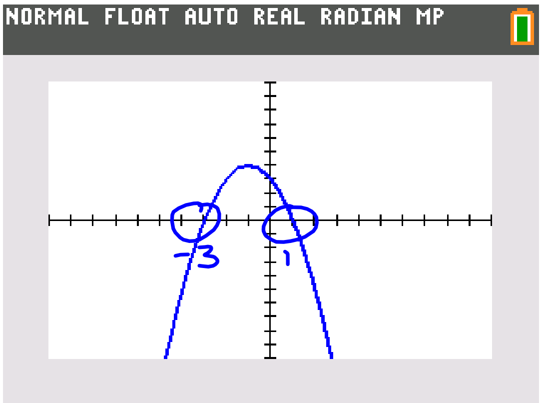
If (x)(3x-5)(2x-2)=0, what do you know about the factors?

$x = 0$ or $3x - 5 = 0$ or $2x - 2 = 0$

Algebraic steps to solve (find the roots) of a quadratic equation:

1. Get one side equal to zero.
2. Factor
3. Set each factor equal to zero (T-chart)
4. Solve (check if required)
5. Write the solution

Example: Find the roots of the equation $0 = -x^2 - 2x + 3$ algebraically.



$\cdot(-1) \quad \cdot(-1)$

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

$p = -3$

$s = 2$

$\frac{3}{-1 \quad 3}$

$0 = (x-1)(x+3)$

$x - 1 = 0$	$x + 3 = 0$
$x = 1$	$x = -3$

$\{1, -3\}$

Find the roots of the following equations by factoring.

1. $x^2 - 5x - 6 = 0$

$P = -6$
$S = -5$
$-6 \quad 1$

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

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

$\{6, -1\}$

2. $x^2 - 8x = 0$

$x(x-8) = 0$

$x=0 \mid x-8=0$
$x=8$

$\{0, 8\}$

3. $25x^2 = 9$

$25x^2 - 9 = 0$

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

$5x+3=0 \mid 5x-3=0$
$5x=-3 \mid 5x=3$
$x=\frac{-3}{5} \mid x=\frac{3}{5}$

$\{\pm\frac{3}{5}\}$

4. $40x = 8x^2 + 50$

$-40x \quad -40x$

$\frac{0}{2} = \frac{8x^2 - 40x + 50}{2}$

$0 = 4x^2 - 20x + 25$

$P=100$
$S=-20$
$-10, -10$

$0 = 4x^2 - 10x - 10x + 25$

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

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

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

$2x-5=0$
$2x=5$
$x=5/2$

$\{5/2\}$

x-int on graphs has same value as roots (solutions) of equation.

$\hookrightarrow y=0$

Find the zeros of the following functions by factoring.

5. $f(x) = x^4 - 13x^2 + 36$

$0 = x^4 - 13x^2 + 36$

$0 = (x^2 - 4)(x^2 - 9)$

P = 36
S = -13
-4, -9

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

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

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

6. $f(x) = x^3 - 2x^2 - 9x + 18$

$0 = \underbrace{x^3 - 2x^2}\ \underbrace{-9x + 18}$

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

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

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

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

$\{2, \pm 3\}$

7. What is the solution of $(x - 5)^{50} = 0$?

$0^{50} = 0$ so: $x - 5 = 0$

$x = 5$

If we know the zeros of a function we can work backward to write a rule for the function.

$f(x) = (x - z_1)(x - z_2)$ where z_1 and z_2 are the zeros of the function.
(You can also use the roots of an equation)

Example:

$f(x) = ax^2 + bx + c$

1. Write a quadratic function in standard form with zeros 2 and -1.

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

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

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

2. Write a quadratic function in standard form with zeros 5 and -5.

$f(x) = (x-5)(x+5)$

$f(x) = x^2 + 5x - 5x - 25$

$\boxed{f(x) = x^2 - 25}$