

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

1-8 HW Answer Key
 Requiz by end of week
 Wednesday Open House 6-8pm
 Thursday Quiz 2 (Days 4-9)
 Next Wednesday Test
 Tues 9/24 1st Math League
 Meeting in LGR 2:30pm

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

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

Find the roots of each equation by factoring.

Short PLS
 2. $x^2 - 6x + 9 = 0$ $P=9, S=-6$
 $(x-3)(x-3)=0$ $-3, -3$
 $x-3=0 \mid x=3$
 $x=3 \mid x=3$
 $\{3\}$

GCIF
 4. $m^3 - 9m^2 = 0$
 $m^2(m-9)=0$
 $m^2=0 \mid m-9=0$
 $m=0 \mid m=9$
 $\{0, 9\}$

GCIF/DOTS
 6. $4x^3 - 100x = 0$
 $4x(x^2 - 25) = 0$
 $4x(x+5)(x-5) = 0$
 $4x=0 \mid x+5=0 \mid x-5=0$
 $x=0 \mid x=-5 \mid x=5$ $\{0, \pm 5\}$

Short PLS
Find the zeros of each function by factoring.
 7. $f(x) = x^2 - 7x + 6$ $P=6, S=-7$
 $x^2 - 7x + 6 = 0$ $S=-1, -6$
 $(x-6)(x-1) = 0$
 $x-6=0 \mid x-1=0$
 $x=6 \mid x=1$
 $\{1, 6\}$

GCIF/Short PLS
 3. $5x^2 + 20 = 20x$
 $5x^2 - 20x + 20 = 0$
 $5x^2 - 20x + 20 = 0$ $P=4, S=-4$
 $(x-2)(x-2) = 0$ $-2, -2$
 $x-2=0 \mid x-2=0$
 $x=2 \mid x=2$ $\{2\}$

DOTS
 5. $9x^2 = 49$
 $9x^2 - 49 = 0$
 $(3x-7)(3x+7) = 0$
 $3x-7=0 \mid 3x+7=0$
 $3x=7 \mid 3x=-7$
 $x=7/3 \mid x=-7/3$
 $\{ \pm 7/3 \}$

Long PLS
 8. $g(x) = 2x^2 - 5x + 2$ $P=4, S=-5$
 $2x^2 - 5x + 2 = 0$ $-4, -1$
 $2x^2 - 4x - 1x + 2 = 0$
 $2x(x-2) - 1(x-2) = 0$
 $(x-2)(2x-1) = 0$
 $x-2=0 \mid 2x-1=0$
 $x=2 \mid 2x=1$
 $x=2 \mid x=1/2$
 $\{2, 1/2\}$

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short PIS / OOTS

9. $f(t) = t^4 - 20t^2 + 64$ $P=64$
 $t^4 - 20t^2 + 64 = 0$ $S=-20$
 $(t^2-4)(t^2-16)=0$ $-4, -16$
 $(t+2)(t-2)(t+4)(t-4)=0$
 $t+2=0$ $t-2=0$ $t+4=0$ $t-4=0$
 $t=-2$ $t=2$ $t=-4$ $t=4$
 $\{ \pm 2, \pm 4 \}$

Grouping OOTS

10. $g(x) = x^3 + 3x^2 - 4x - 12$
 $x^3 + 3x^2 - 4x - 12 = 0$
 $x^2(x+3) - 4(x+3) = 0$
 $(x+3)(x^2-4) = 0$
 $(x+3)(x+2)(x-2) = 0$
 $x+3=0$ $x+2=0$ $x-2=0$
 $x=-3$ $x=-2$ $x=2$
 $\{ -3, -2, 2 \}$

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 $(y-7)^{28} = 0$?
 $(y-7)(y-7) \dots = 0$
 $y=7$ $y=7$
 $\{ 7 \}$
 $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

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

14. Simplify $(7x - 4y)(3x + 2y)$.
 $= 21x^2 + 14xy - 12xy - 8y^2$
 $= 21x^2 + 2xy - 8y^2$

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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.

If an equation has all factors set = to 0, then we know at least one of the factors must be = 0. We can set each factor = 0 to solve the equation.

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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. $(-2, 0)$ $(2, 0)$

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 $y = \underline{0}$.

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.

$$\begin{aligned} f(x) &= x^2 - 4 \\ x^2 - 4 &= 0 \\ (x-2)(x+2) &= 0 \\ x &= 2 \quad | \quad x = -2 \quad \{ -2, 2 \} \end{aligned}$$

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.

$$\begin{aligned} \text{Check } x &= 2 \\ x^2 - 4 &= 0 \\ (2)^2 - 4 &= 0 \\ 4 - 4 &= 0 \\ 0 &= 0 \checkmark \end{aligned}$$

$$\begin{aligned} \text{check } x &= -2 \\ (-2)^2 - 4 &= 0 \\ 4 - 4 &= 0 \\ 0 &= 0 \end{aligned}$$

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Tip for finding pair of numbers that give correct product/sum:

Enter the following into Y_1 and Y_2 on calculator: $Y_1 = \text{prod}/x$

$$Y_2 = \text{prod}/x + x$$

Go to the table and find the sum in Y_2 column. The pair of numbers you want are the corresponding X and Y_1

Example: $x^2 - 19x + 48$

Prod = 48, Sum = -19

NORMAL FLOAT AUTO a+bi RADIAN MP			
Plot1	Plot2	Plot3	
$Y_1 = 48/X$			
$Y_2 = 48/X + X$			
$Y_3 =$			
$Y_4 =$			
$Y_5 =$			
$Y_6 =$			
$Y_7 =$			
$Y_8 =$			
$Y_9 =$			

NORMAL FLOAT AUTO a+bi RADIAN MP			
PRESS $\blacktriangleleft$ TO EDIT FUNCTION			
X	Y_1	Y_2	
-5	-9.6	-14.6	
-4	-12	-16	
-3	-16	-19	
-2	-24	-26	
-1	-48	-49	
0	ERROR	ERROR	
1	48	49	
2	24	26	
3	16	19	
4	12	16	
5	9.6	14.6	

$Y_2 = -19$

From the table you can see the correct numbers are -3, -16

Sep 10-7:54 AM

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. $f(x) = 2x^2 + x - 15$ $P = -\frac{30}{5} = -6$

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

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

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

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

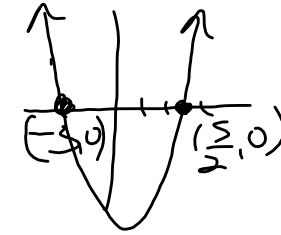
$$x = -3 \quad 2x-5 = 0$$

$$2x = 5$$

$$x = \frac{5}{2}$$

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

b. Graphic check



c. Algebraic check

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

$$2(9) - 18 - 15 = 0$$

$$18 - 18 - 15 = 0$$

$$0 - 15 = 0$$

$$-15 = 0$$

$$2(\frac{5}{2})^2 + (\frac{5}{2}) - 15 = 0$$

$$2(\frac{25}{4}) + \frac{5}{2} - 15 = 0$$

$$\frac{25}{2} + \frac{5}{2} - 15 = 0$$

$$\frac{30}{2} - 15 = 0$$

$$15 - 15 = 0$$

$$0 = 0 \checkmark$$

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

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

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

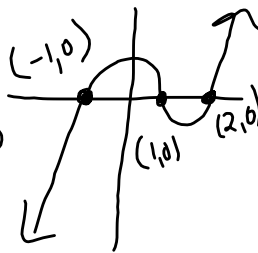
$$(x-2)(x^2-1) = 0$$

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

$$x=2 \quad x=-1 \quad x=1$$

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

b. Graphic check



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

4. $4x^2 = 36$

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

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

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

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

$$x=-3 \quad x=3 \quad \{-3, 3\}$$

5. $4x^2 = 7$

$$4x^2 - 7 = 0$$

$$4x^2 = 7$$

$$x^2 = \frac{7}{4}$$

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

$$\{\pm \frac{\sqrt{7}}{2}\}$$

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

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

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

$$4x^5(x^2 - 7x + 12) = 0$$

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

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

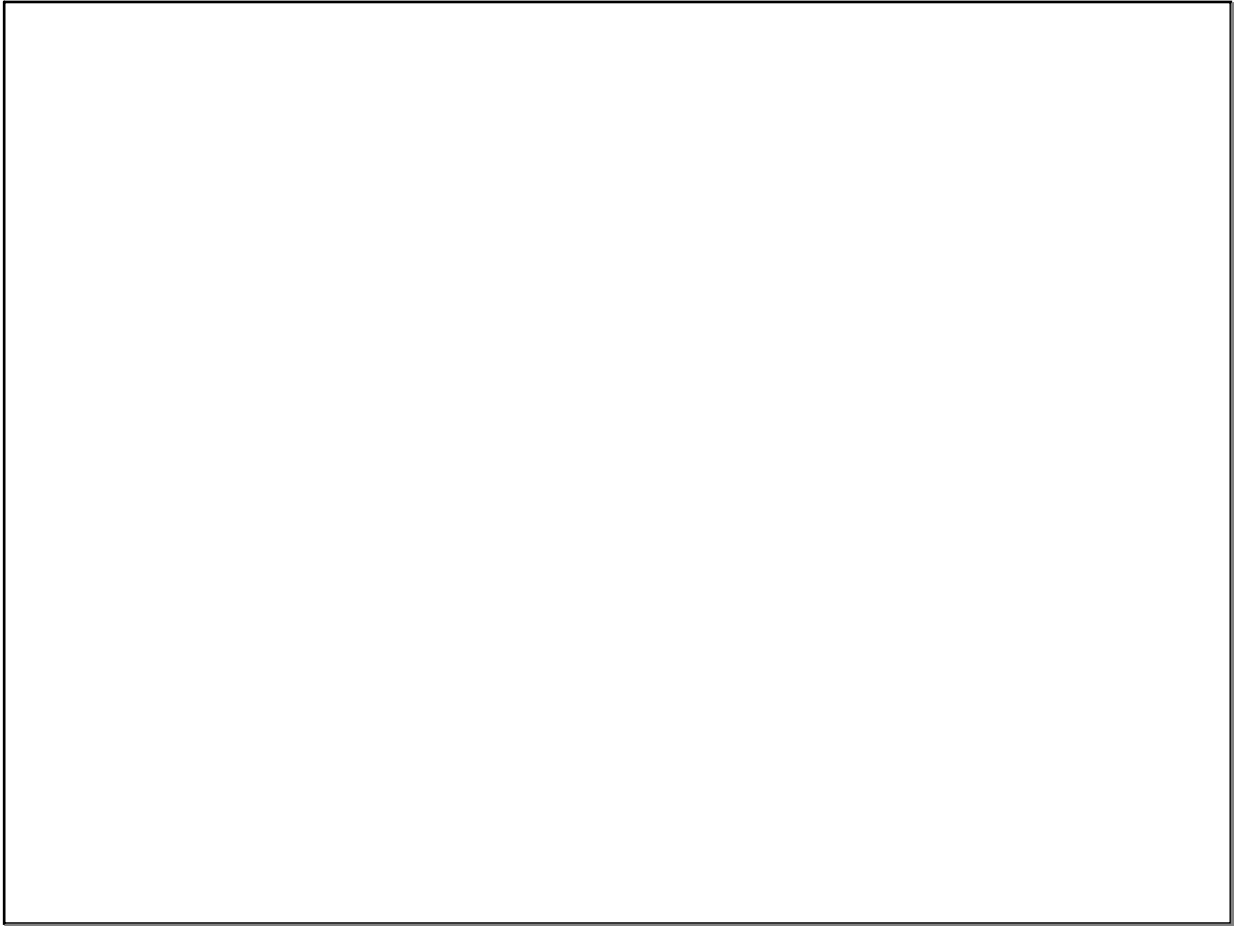
$$x^5 = 0$$

$$x = 0$$

$$\{0, 3, 4\}$$

7. $f(t) = t^3 - 10t^2 + 21t$

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