

NAME: _____

NOTE: WRITE YOUR NAME ON ALL PAGES.

TEACHER: MADARANG

SUBJECT: ALGEBRA 1 WEEK 4 Due May 15th

PERIOD: _____

WEEK 4: Solving Quadratic Equations Using Square Roots and Graphing Quadratic Functions

Topic 1: Solving by Factoring (REVIEW)

Discussion: For the last two weeks, you have been exposed to factoring quadratic trinomials and solving for the quadratic equation by factoring.

Let's review: Solve the quadratic equations by factoring:

Example 1: $x^2 - 5x - 14 = 0$ → what is our magic pair?

Since: $(-7)(2) = -14$ and $-7+2 = -5$, then our magic pair is -7 and 5.

$(x - 7)(x + 2) = 0$ → factoring the trinomial

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$x - 7 = 0$ $x + 2 = 0$ → making each = 0
+7 +7 -2 -2 → isolating the variable

$$x = 7$$

$$x = -2 \rightarrow \text{solution}$$

Example 2: $2x^2 + 7x - 15 = 0$

To find the magic pair, we have to multiply 2 and -15, so $2 \cdot (-15) = -30$. Since $10(-3) = -30$ and $10 + -3 = 7$, then our magic pair is 10 and -3. Our equation becomes:

$2x^2 + 10x - 3x - 15 = 0$ → split the middle

$(2x^2 + 10x) - (3x + 15) = 0$ → grouping

$2x(x + 5) - 3(x + 5) = 0$ → factoring 1

$(x + 5)(2x - 3) = 0$ → factoring 2

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

$$x = -5$$

$$2x = 3$$

$$x = \frac{3}{2}$$

Solve each equation by factoring. SHOW YOUR WORK!!!

1) $x^2 - 12x + 35 = 0$

2) $x^2 + 6x + 5 = 0$

3) $x^2 + 3x - 40 = 0$

4) $x^2 + x - 6 = 0$

5) $5x^2 - 11x + 6 = 0$

6) $5x^2 + 37x + 14 = 0$

7) $5x^2 + 41x + 8 = 0$

8) $5x^2 - 2x - 16 = 0$

Topic 2A: Solving Quadratic Equations by Taking Square Roots

Example 3:

Solve by taking the square roots

$$4x^2 - 1 = 15 \rightarrow \text{given}$$

$$4x^2 - 1 + 1 = 15 + 1 \rightarrow \text{add 1 on both sides of the eq}$$

$$4x^2 = 16 \rightarrow \text{simplify/combine like terms}$$

$$\frac{4x^2}{4} = \frac{16}{4} \rightarrow \text{divide both sides by 4}$$

$$x^2 = 4 \rightarrow \text{simplify the fractions}$$

$$\sqrt{x^2} = \pm\sqrt{4} \rightarrow \text{get the square root of both sides of the eq.}$$

$$x = \pm 2 \rightarrow \text{simplify the radicals}$$

$$x = 2 \text{ and } x = -2 \rightarrow \text{separate the positive and negative values}$$

Example 4:

Solve by taking the square roots:

$$25x^2 - 2 = 7 \rightarrow \text{given}$$

$$25x^2 - 2 + 2 = 7 + 2 \rightarrow \text{add 2 on both sides of the eq}$$

$$25x^2 = 9 \rightarrow \text{simplify}$$

$$\frac{25x^2}{25} = \frac{9}{25} \rightarrow \text{divide both sides by 25}$$

$$x^2 = \frac{9}{25} \rightarrow \text{simplify } \frac{25}{25}$$

$$\sqrt{x^2} = \pm\sqrt{\frac{9}{25}} \rightarrow \text{get the square root of both sides}$$

$$x = \pm\frac{3}{5} \rightarrow \text{simplify radicals}$$

$$x = \frac{3}{5} \text{ and } x = -\frac{3}{5} \rightarrow \text{separate the positive and the negative values}$$

Solve each equation by taking square roots. SHOW ALL THE STEPS!!

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

10) $9x^2 + 6 = 735$

11) $4x^2 - 6 = 394$

12) $-8 + 81x^2 = 56$

13) $36x^2 + 4 = 40$

14) $64x^2 + 10 = 19$

15) $100x^2 + 3 = 7$

16) $9x^2 - 6 = 19$

17) $9x^2 + 9 = 450$

18) $8x^2 - 8 = 64$

Topic 2B: Solving Quadratic Equations by Taking Square Roots in a Quantity

<p>Example 5: Solve by taking the square roots $(x - 2)^2 = 25 \rightarrow$ given $\sqrt{(x - 2)^2} = \pm\sqrt{25} \rightarrow$ get the square root of both sides $x - 2 = \pm 5 \rightarrow$ simplify the radicals</p> <p>Separate the two answers +5 and -5 as two linear equations $x - 2 = 5$ and $x - 2 = -5$ $x - 2 + 2 = 5 + 2$ $x - 2 + 2 = -5 + 2$</p> <p>\rightarrow solve for x by adding 2 to both sides of the equation for BOTH equations</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid red; border-radius: 50%; padding: 5px; text-align: center;"> $x = 7$ </div> <div style="border: 1px solid red; border-radius: 50%; padding: 5px; text-align: center;"> $x = -3$ </div> </div> <p>\rightarrow simplifying by combining like terms</p>	<p>Example 6: Solve by taking the square roots $2(x - 5)^2 + 1 = 9 \rightarrow$ given $2(x - 5)^2 + 1 - 1 = 9 - 1 \rightarrow$ add 1 to both sides $2(x - 5)^2 = 8 \rightarrow$ simplify by combining like terms</p> <p style="text-align: center;">$\frac{2(x-5)^2}{2} = \frac{8}{2} \rightarrow$ divide by 2 on both sides</p> <p>Now you have isolated the quadratic expression. $(x - 5)^2 = 4$ $\sqrt{(x - 5)^2} = \pm\sqrt{4} \rightarrow$ get the square root of both sides $(x - 5) = \pm 2 \rightarrow$ simplify the radicals</p> <p>$(x - 5) = 2$ and $(x - 5) = -2$ \rightarrow separate the two answers, then solve for x. $x - 5 + 5 = 2 + 5$ $x - 5 + 5 = -2 + 5$</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid red; border-radius: 50%; padding: 5px; text-align: center;"> $x = 7$ </div> <div style="border: 1px solid red; border-radius: 50%; padding: 5px; text-align: center;"> $x = 3$ </div> </div>
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Solve each equation by taking the square roots. SHOW ALL THE STEPS!!!

19. $(x + 5)^2 - 6 = 43$

20. $(x - 1)^2 - 19 = 81$

21. $(x - 14)^2 + 13 = 12$

22. $2(x - 3)^2 + 1 = 73$

23. $(x - 1)^2 + 14 = 15$

24. $2(x + 1)^2 + 5 = 55$

25. $2(x - 1)^2 - 1 = 49$

26. $5(x - 7)^2 + 10 = 190$

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Topic 3: Graphing Quadratic Functions

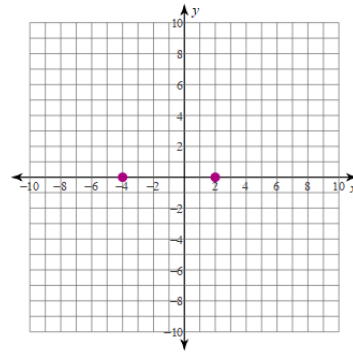
Graph the quadratic function $f(x) = x^2 + 2x - 8$

STEP 1: Make the equation equal to zero and solve by factoring:

$$\begin{aligned} x^2 + 2x - 8 &= 0 \\ (x + 4)(x - 2) &= 0 \\ x + 4 &= 0 & \text{and} & \quad x - 2 = 0 \\ x &= -4 & & \quad x = 2 \end{aligned}$$

These will be your x-intercepts on the graph. Write them as ordered pairs $(-4, 0)$ and $(2, 0)$

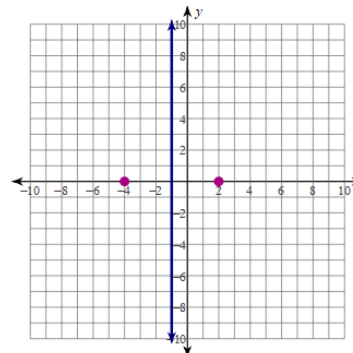
Let's plot the x-intercepts $(-4, 0)$ and $(2, 0)$



STEP 2: Get the midpoint of -4 and 2 and draw a vertical line through this point.

$$\frac{-4 + 2}{2} = \frac{-2}{2} = -1 \rightarrow \text{your line of symmetry is } x = -1$$

Draw the vertical line $x = -1$ on the graph.

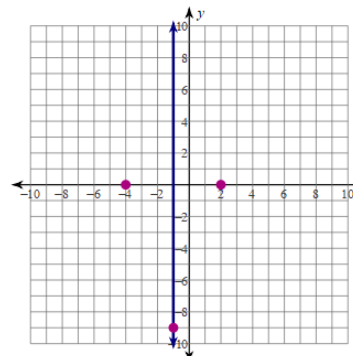


STEP 3: Substitute $x = -1$ into the equation to find the y-value

$$\begin{aligned} f(x) &= x^2 + 2x - 8 \\ y &= x^2 + 2x - 8 \\ y &= (-1)^2 + 2(-1) - 8 \\ y &= 1 - 2 - 8 \\ y &= -9 \end{aligned}$$

This becomes another point on your graph $(-1, -9)$
We call this your **VERTEX**.

Let's plot the vertex $(-1, -9)$ on the graph.



Step 4: Since you now have 3 points, you can now graph your parabola. Your vertex will be your lowest (or highest point) of your curve, but it should be exactly in between your x-intercepts.

As you can see, your parabola is perfectly symmetrical on both sides of your line of symmetry!

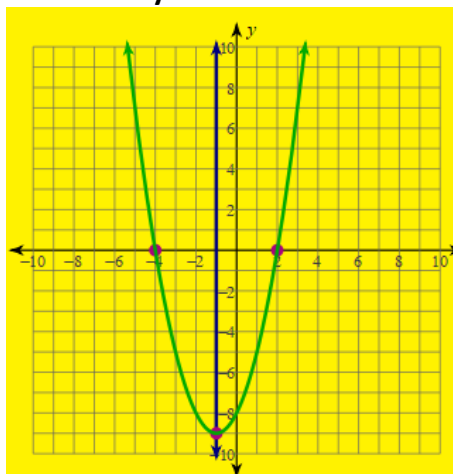
Note: This is not a U-shaped graph.

This is not a V-shaped graph.

It's a parabola! And you graphed it with just 3 points!

(You might want to google what parabolas look like and where you can find them.)

Let's draw your curve now.



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Okay, let's do this! Graph the following quadratic functions. SHOW ALL THE STEPS!

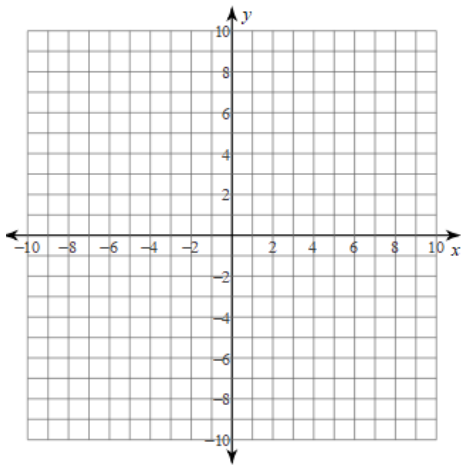
27. Graph: $f(x) = x^2 + 2x - 3$

STEP 1:

STEP 2:

STEP 3:

STEP 4:



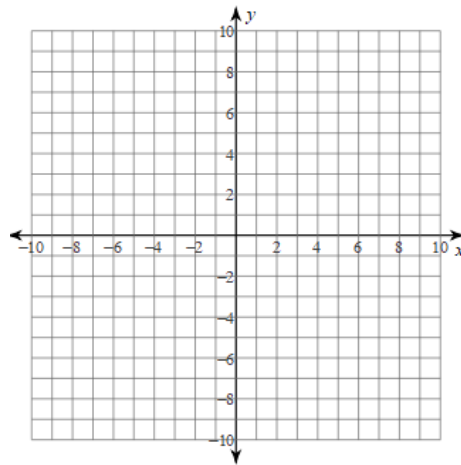
28. Graph: $f(x) = x^2 + 6x + 5$

STEP 1:

STEP 2:

STEP 3:

STEP 4:



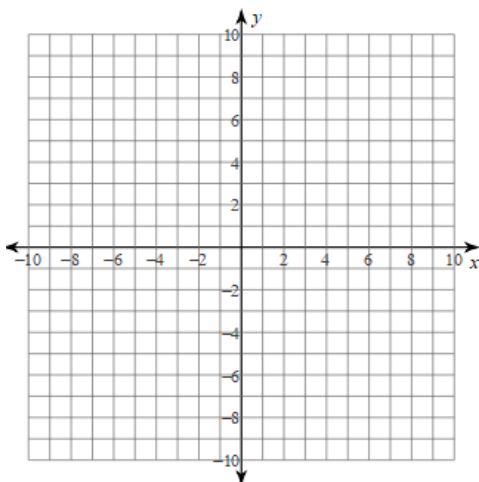
29. Graph: $f(x) = x^2 - 2x - 3$

STEP 1:

STEP 2:

STEP 3:

STEP 4:



30. Graph: $f(x) = x^2 + 10x + 16$

STEP 1:

STEP 2:

STEP 3:

STEP 4:

