Quadratic Equations Quiz #2

Part 1: Solve each equation by factoring.

1. \( x^2 + 4x - 32 = 0 \)
2. \( 4x^2 - 2x - 6 = 0 \)
3. \( 4x^2 + 14x = 0 \)
4. \( 4x^2 - 12x = -9 \)
5. \( 6x^2 + 5x = 4 \)
6. \( 9x^2 = -6x - 1 \)

Part 2: For each problem below, write an equation and solve.

1. One integer is 2 less than three times another. Their product is 16. Find the integers.

2. The length of a rectangle is 1 yd more than twice its width. If the area is 36 yd\(^2\), find the length and width of the rectangle.

Part 3: Create a graph for the following equation. Show how you found the x-intercepts, vertex, and y-intercept.

\[ Y = 2x^2 - 7x - 4 \]

X-intercepts: 

Vertex: 

Y-intercept: 

Quadratic Equations Quiz #2 – Answer Key

Part 1: Solve each equation by factoring. (2 points each)

1. \( x^2 + 4x - 32 = 0 \)

   Step 1: Since the equation is set equal to 0, we can factor.
   
   \((x+8)(x-4) = 0\)

   Step 2: Set each factor equal to 0 and solve.
   
   \[x + 8 = 0 \quad \text{and} \quad x - 4 = 0\]
   
   \[x = -8 \quad \text{and} \quad x = 4\]  (Final answer)

2. \( 4x^2 - 2x - 6 = 0 \)

   Step 1: Since the equation is set equal to 0, we can factor.
   
   \((2x+2)(2x-3) = 0\)

   **You may also have factored out the GCF of 2:**
   
   \[2(2x^2 - x - 3) = 0\]
   
   \[2(2x - 3)(x+1) = 0\]
   
   \[2≠0 \quad 2x - 3 = 0 \quad x+1 = 0\]
   
   \[2x = 3 \quad x = -1\]
   
   **(Final Answer) x = -1 and x = 3/2**

3. \( 4x^2 + 14x = 0 \)

   Step 1: Since the equation is set equal to 0, we can factor. First factor out the GCF (which is 2x)
   
   \[2x(2x + 7) = 0\]

   Step 2: Set each factor equal to 0
   
   \[2x = 0 \quad \text{and} \quad 2x + 7 = 0\]
   
   \[x = 0 \quad \text{and} \quad x = -7/2\]  (Final answer)
4. \[4x^2 - 12x = -9\]

Set the equation equal to 0 by adding 9 to both sides.

\[4x^2 - 12x +9 = -9+9\]

\[4x^2 - 12x +9=0\] Notice how the lead coefficient is a perfect square and the constant is a perfect square. The middle term is negative and the constant is positive. This means that the factor is a perfect square.

\[(2x-3)^2 = 0\]

\[2x-3 +3 = 0+3\]

\[2x = 3\]

\[2x/2 = 3/2\]

\[x = 3/2\]

**Note**

There is only one answer to this problem, because the \(x\)-intercept is the vertex. Therefore, this parabola only touches the \(x\)-axis once at the vertex.

5. \[6x^2 + 5x = 4\]

Step 1: First set the equation equal to 0 by subtracting 4 from both sides.

\[6x^2 + 5x - 4 = 4-4\]

\[6x^2 + 5x - 4 = 0\]

Step 2: Factor the new equation.

\[6x^2 + 5x - 4 = 0\] or \[(3x+4)(2x-1)\]

Step 3: Set each factor equal to 0.

\[(3x+4)=0\] and \[(2x-1) = 0\]

\[3x+4 -4 = 0-4\]

\[3x =-4\]

\[3x/3 = -4/3\]

\[x = -4/3\]

\[x = -4/3\] and \[x = 1/2\] (Final Answer)
6. $9x^2 = -6x - 1$

**Step 1:** Rewrite in standard form by adding $6x$ and adding $1$ to both sides.

$9x^2 + 6x + 1 = -6x + 6x - 1 +1$

$9x^2 + 6x + 1 = 0$

**Step 2:** Factor the new equation.

$9x^2 + 6x + 1 = 0$ or $(3x+1)(3x+1)$

**Step 2:** Set each factor equal to $0$

$3x+1 = 0$ and $3x +1 =0$ (Since they are the same, we only need to solve $1$)

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

$3x= -1$

$3x/3 = -1/3$

$x= -1/3$ There is only one solution because the vertex is the x-intercept, so the graph only touches the x-axis at $x = -1/3$.

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**Part 2:** For each problem below, write an equation and solve. (2 points each)

1. One integer is 2 less than three times another. Their product is 16. Find the integers.

Let $x =$ Integer #1  
Integer #2 = $3x - 2$ (2 less than twice another)

Since the direction says “their product” is 16, we must multiply the two expressions.

$x(3x-2) = 16$

$3x^2 - 2x = 16$  
Distribute the $x$.

$3x^2 - 2x - 16 = 16 - 16$  
Subtract 24 from both sides in order to set the equation equal to $0$.

$3x^2 - 2x - 16 = 0$

$(3x-8)(x+2) = 0$  
Factor

$3x-8 = 0$  
$x+2=0$  
Set the factors equal to $0$

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

$3x=8$  
$x=-2$

We’re looking for a set of integers, and $8/3$ is not an integer.

So, we will use -2 as our first integer and the other is $3x - 2$ or $3(-2)-2 = -8$. **The integers are -2 and -8.**  
Check: $(-2)(-8) = 16$
2. The length of a rectangle is 1 yd more than twice its width. If the area is 36 yd\(^2\), find the length and width of the rectangle.

Let \( w \) = width of the rectangle. \( L = 2w+1 \) (1 more than twice its width)

Since we know the area is 36 yd\(^2\), we know that we must multiply length and width. \( A = lw \)

\[
A = lw
\]

\[
36 = w(2w+1) \quad \text{Substitute.}
\]

\[
2w^2 + w = 36 \quad \text{Distribute the } w \text{ and reverse the equation to put 36 on the right.}
\]

\[
2w^2 + w - 36 = 36-36 \quad \text{Subtract 36 from both sides in order to set the equation equal to 0}
\]

\[
2w^2 + w - 36 = 0
\]

\[
(2w +9)(w-4) = 0 \quad \text{Factor the trinomial using the guess and check method.}
\]

\[
2w+9 = 0 \quad w - 4 = 0 \quad \text{Set each factor equal to 0.}
\]

\[
2w+9-9 = 0-9 \quad w-4+4 = 0+4
\]

\[
2w = -9 \quad w = 4
\]

\[
2w/2 = -9/2 \quad W = -9/2 \text{ or } -4.5
\]

Since the width of a rectangle can’t be negative, we can eliminate -4.5. The width is 4 yd. The length is 9 yd.

\[
L = 2w+1; \quad L = 2(4)+1 \quad L = 9
\]
Part 3: Create a graph for the following equation. Show how you found the x-intercepts, vertex, and y-intercept. (4 points)

\[ Y = 2x^2 - 7x - 4 \]

**X-intercepts:** \[ x = 4 \text{ or } x = -\frac{1}{2} \]

Let \( y = 0 \) and factor:
\[ 2x^2 - 7x - 4 = 0 \text{ or } (2x+1)(x-4) = 0 \]
Set each factor equal to 0
\[ x-4 = 0 \text{ or } 2x +1 = 0 \]
\[ x = 4 \text{ or } 2x = -1 \]
\[ x = 4 \text{ or } 2x/2 = -1/2 \]
\[ x = 4 \text{ or } x = -\frac{1}{2} \]

**Vertex:** \((1.75, -10.125)\)

Vertex formula: \( x = -b/2a \)
\[ b = -7 \quad a = 2 \]
\[ X = \frac{(-7)}{2(2)} \]
\[ X = 7/4 \quad \text{The x coordinate of the vertex is } 1.75 \]
Substitute 1.75 for \( x \) and solve for \( y \).
\[ Y = 2(1.75)^2 - 7(1.75) - 4 \]
\[ y = -10.125 \quad \text{Vertex } = (1.75, -10.125) \]

**Y-intercept:** \((0, -4)\)

The y-intercept is “c” in the equation.
Therefore, the y-intercept is -4.
The y-intercepts mirror point is \((3.5, -4)\)
(The x-intercept is 1.75, so 1.75+1.75 = 3.5 for the x-coordinate of the mirror point)

This Quiz is worth 20 points.