

Assignment

Write

Describe the process to solve a quadratic equation by factoring.

Remember

- Completing the square is a process for writing a quadratic expression in vertex form which then allows you to solve for the zeros.
- Given a quadratic equation in the form $y = ax^2 + bx + c$, the vertex of the function is located at $x = \frac{-b}{2a}$ and $y = c - \frac{b^2}{4a}$.

Practice

1. Solve each equation.

- a. $0 = x^2 - 7x - 18$ b. $x^2 + 10x = 39$
c. $0 = x^2 - 10x + 12$ d. $2x^2 + 4x = 0$
e. $3x^2 - 22x + 7 = 0$

2. Determine the roots of the equation $y = x^2 + 9x + 3$. Check your solutions.

3. Consider the equation $y = 2x^2 + 10x - 8$.

- a. Graph the equation.
b. Use the graph to estimate the solutions to the equation. Explain how you determined your answer.
c. Two students completed the square to determine the solutions to this equation. Their work is shown. Who is correct? Explain your reasoning.

Student 1

$$\begin{aligned}y &= 2x^2 + 10x - 8 \\2x^2 + 10x - 8 &= 0 \\2x^2 + 10x &= 8 \\2x^2 + 10x + 25 &= 8 + 25 \\(2x + 5)^2 &= 33 \\\sqrt{(2x + 5)^2} &= \pm\sqrt{33} \\2x + 5 &= \pm\sqrt{33} \\x &= \frac{-5 \pm \sqrt{33}}{2} \\X \approx -5.372 \text{ and } x \approx 0.372\end{aligned}$$

Student 2

$$\begin{aligned}y &= 2x^2 + 10x - 8 \\2x^2 + 10x - 8 &= 0 \\\frac{2x^2 + 10x - 8}{2} &= 0 \\x^2 + 5x &= 4 \\x^2 + 5x + \frac{25}{4} &= 4 + \frac{25}{4} \\(x + \frac{5}{2})^2 &= \frac{41}{4} \\\sqrt{(x + \frac{5}{2})^2} &= \pm\sqrt{\frac{41}{4}} \\x + \frac{5}{2} &= \pm\frac{\sqrt{41}}{2} \\x &= \frac{-5 \pm \sqrt{41}}{2} \\x \approx -5.702 \text{ and } x \approx 0.702\end{aligned}$$

- d. Compare the different solutions. Identify what the student who got the correct answer did that allowed him or her to correctly complete the square.
e. Write a statement about the value of the coefficient of the x^2 -term before you can complete the square.

4. Determine the roots of the equation $y = 3x^2 + 24x - 6$. Check your solutions.

5. Determine the roots and the location of the vertex of $y = x^2 + 20x + 36$. Write the zeros in terms of the axis of symmetry and the parabola.

Stretch

The function g is defined by $g(x) = x^2 - 3x - 10$. If $g(x + 3) = x^2 + bx - c$, what are the values of b and c ? Show your work and justify your answer.

Review

- For each quadratic function, determine if it has an absolute minimum or absolute maximum, if the graph opens upward or downward, and identify the y -intercept.
 - $f(x) = 3x^2 + 6x - 72$.
 - $f(x) = -\frac{1}{2}(x - 2)(x + 5)$.
- Sketch a graph of each quadratic function. Determine the zeros of each function.
 - $f(x) = (x + 6)^2$
 - $f(x) = 3(x - \frac{9}{2})^2 - 5$
- Write the equation of the function, $g(x)$, whose graph transforms the graph $f(x) = x^2$ by reflecting it across the x -axis, vertically compressing it by a factor of $\frac{1}{2}$, and moving it down 3 units.
- Graph the function, $g(x)$, whose graph transforms the graph $f(x) = x^2$ by vertically stretching it by a factor of 3 and moving it up 4 units.