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or the form
 $y = ax^2 + bx + c$

June 5

Factored Form

A. Write the x values that correspond to $y = 0$. These values are called **zeros**.

$x = -1$ and $x = 5$

B. Use the zeros from part A to fill in the blanks.

$y = a(x - -1)(x - 5)$

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Lesson 3.2: Relating the Standard and Factored Forms 49

TURN

C. The given point, $(-1, 24)$, satisfies the quadratic equation. Substitute this point into your equation from part B. Remember to include the...



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$$y = a(x-1)(x-5)$$

$$24 = a(-1-1)(-1-5)$$

$$24 = a(-2)(-6)$$

$$24 = a(12)$$

$$\frac{24}{12} = \frac{a(12)}{12}$$

$$a = 2$$

Hint
Pay attention to the signs of the terms when multiplying.

C. The given point, $(-1, 24)$, satisfies the quadratic equation. Substitute this point into your equation from part B. Remember to include the zeros. Then solve for a .

$$24 = a(\underline{\quad} - \underline{\quad})(\underline{\quad} - \underline{\quad})$$

$$\underline{\quad} = \underline{\quad}$$

$$\underline{\quad} = \underline{\quad}$$

$$\underline{\quad} = \underline{\quad}$$

D. Write the zeros and the value of a in the appropriate blanks. This is the factored form of the quadratic equation.

$$y = \underline{\quad}(x - \underline{\quad})(x - \underline{\quad})$$

Standard Form

E. Expand and simplify the equation in part D.

$$y = \underline{\quad}(x - \underline{\quad})(x - \underline{\quad})$$

$$y = \underline{\quad}(\underline{\quad})$$

$$y = \underline{\quad}(\underline{\quad})$$

Now multiply each term in the brackets by the value of a .

$$y = \underline{\quad}$$

This is the standard form of the quadratic function.

FoIL

$$y = 2(x-1)(x-5)$$

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

$$y = 2(x^2 - 6x + 5)$$

$$y = 2x^2 - 12x + 10$$



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MATH TERM
maximum (or minimum): the y value at the vertex of a quadratic function.

$y = -5t^2 + 20t$
 $-5t \quad -5t$
 $y = -5t(t - 4)$
Either
 $-5t = 0 \quad t = 0$
 $t - 4 = 0 \quad t = 4$
SS = { 0, 4 }

The standard form of a quadratic function is $h(t) = -5t^2 + 20t$. What are the zeros of the function? What is the maximum of the function?

A. Factor the quadratic function by finding the common factor of $-5t^2$ and $20t$.
 $h(t) = -5t(t - 4)$

B. Find the zeros of the function by setting each factor you wrote in part A to zero.
 $t = 0$ and $t = 4$ — A of 5

C. The vertex of a parabola lies on the axis of symmetry. The axis of symmetry is halfway between the zeros. Write the axis of symmetry below.
 $t = 2$

D. Substitute the value of t from part C into the quadratic equation to find the maximum value.
 $h(2) = -5(2)^2 + 20(2)$
 $= -20 + 40$
 $= 20$

E. Write a conclusion. What are the zeros of the function? What is the maximum of the function?
vertex: (2, 20)



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PRACTISING

Text pages 139–142

6. i) Expand each function given in factored form.

ii) Draw an arrow to match each factored form with its standard form.

$$y = (2x + 3)(x - 4)$$

= _____
= _____

$$y = (3x - 4)(x - 3)$$

= _____
= _____

$$y = (3 - 4x)(4 - x)$$

= _____
= _____

$$y = 4x^2 - 19x + 12$$

$$y = 2x^2 - 5x - 12$$

$$y = 3x^2 - 13x + 12$$



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Hint
The axis of symmetry is halfway between the zeros.

- i) Find the zeros of each quadratic function. You may have to factor the equation first.
- ii) State the axis of symmetry.
- iii) Substitute the x value from part ii) into the equation to find the maximum or minimum.

a) $f(x) = (7 - x)(x + 2)$

Axis of symmetry: $x = \underline{\hspace{2cm}}$

Zeros:

Maximum:

$\cancel{y} - \underline{\hspace{1cm}} = 0$ and $\underline{\hspace{1cm}} + \underline{\hspace{1cm}} = 0$

$f(\underline{\hspace{1cm}}) = (7 - \underline{\hspace{1cm}})(\underline{\hspace{1cm}} + 2)$

b) $f(x) = (x + 5)(x - 9)$

Axis of symmetry: $x = \underline{\hspace{2cm}}$

Zeros:

Minimum:

$\underline{\hspace{1cm}} + \underline{\hspace{1cm}} = 0$ and $\underline{\hspace{1cm}} - \underline{\hspace{1cm}} = 0$

$f(\underline{\hspace{1cm}}) = (\underline{\hspace{1cm}} + 5)(\underline{\hspace{1cm}} - 9)$

c) $f(x) = (2x + 3)(8 - x)$

Axis of symmetry: $x = \underline{\hspace{2cm}}$

Zeros:

Maximum:

$\underline{\hspace{1cm}} + \underline{\hspace{1cm}} = 0$ and $\underline{\hspace{1cm}} - \underline{\hspace{1cm}} = 0$

$f(\underline{\hspace{1cm}}) = (2\underline{\hspace{1cm}} + 3)(8 - \underline{\hspace{1cm}})$

d) $f(x) = x^2 + 7x + 10$

Axis of symmetry: $x = \underline{\hspace{2cm}}$

Either
 $7 - x = 0$
 $7 = x$
or
 $x + 2 = 0$
 $x = -2$



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Hint

The axis of symmetry is halfway between the zeros.

1. i) Find the zeros of each quadratic function. You may have to factor the equation first.

ii) State the axis of symmetry.

iii) Substitute the x value from part ii) into the equation to find the maximum or minimum

a) $f(x) = (7 - x)(x + 2)$

Zeros:

_____ - _____ = 0 and _____ + _____ = 0

SS = {7, -2}

b) $f(x) = (x + 5)(x - 9)$

Zeros:

_____ + _____ = 0 and _____ - _____ = 0

c) $f(x) = (2x + 3)(8 - x)$

Zeros:

_____ + _____ = 0 and _____ - _____ = 0

d) $f(x) = x^2 + 7x + 10$

Axis of symmetry: $x =$ _____

Maximum:

$f(\text{_____}) = (7 - \text{_____})(\text{_____} + 2)$

Axis of symmetry: $x =$ _____

Minimum:

$f(\text{_____}) = (\text{_____} + 5)(\text{_____} - 9)$

Axis of symmetry: $x =$ _____

Maximum:

$f(\text{_____}) = (2\text{_____} + 3)(8 - \text{_____})$

Axis of symmetry: $x =$ _____

Either

$7 - x = 0$

$7 = x$

or

$x + 2 = 0$

$x = -2$

$\frac{7 + (-2)}{2}$

$\frac{5}{2}$

$= 2.5$

vertex (2.5, 20.25)

y

w

y