

Warm Up

Factor completely:

$$12x^2 + 2x - 30$$

Mr. Mazzeo's Challenge

$$20x^2 + 14xy - 24y^2$$

Quadratic or not?

$$y = x^3 - x^2(x + 5)$$

Quadratic!

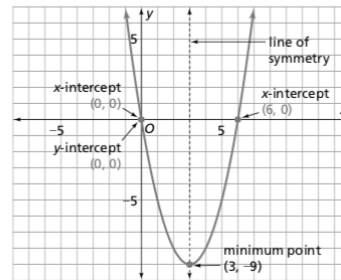
$$\begin{aligned}y &= x^3 - x^2(x + 5) \\ &= x^3 - x^3 - 5x^2 \\ &= -5x^2\end{aligned}$$

highest
order exponent
is 2.

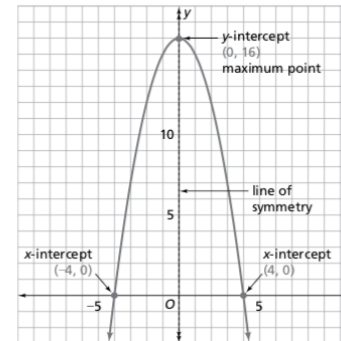
Homework Questions?

Answers to Problem 2.4

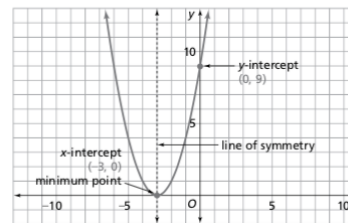
A. 1. $y = x(x - 6) = x^2 - 6x$



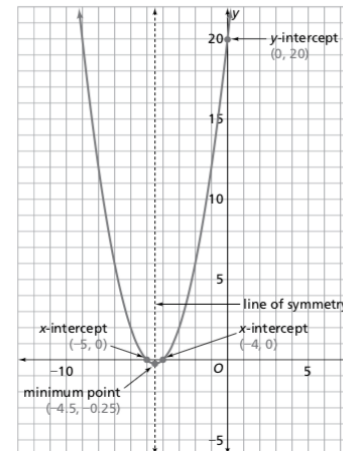
2. $y = 16 - x^2$
 $= 16 + 4x - 4x - x^2$
 $= 4(4 + x) - x(4 + x)$
 $= (4 - x)(4 + x)$



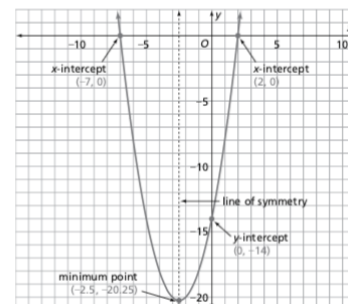
3. $y = x^2 + 6x + 9$
 $= x^2 + 3x + 3x + 9$
 $= x(x + 3) + 3(x + 3)$
 $= (x + 3)^2$



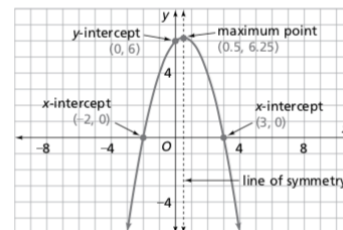
4. $y = x^2 + 9x + 20$
 $= x^2 + 4x + 5x + 20$
 $= x(x + 4) + 5(x + 4)$
 $= (x + 5)(x + 4)$



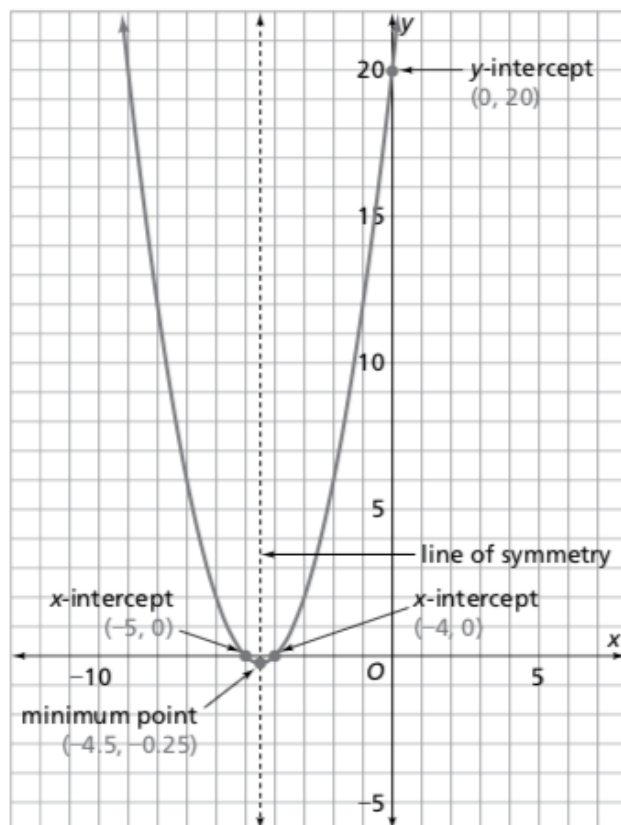
5. $y = x^2 + 5x - 14$
 $= x^2 - 2x + 7x - 14$
 $= x(x - 2) + 7x(x - 2)$
 $= (x + 7)(x - 2)$



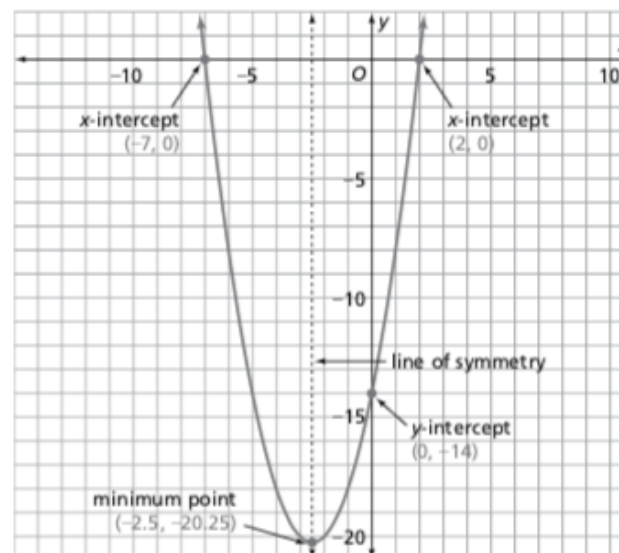
6. $y = (3 - x)(2 + x)$
 $= 6 + 3x - 2x - x^2$
 $= 6 + x - x^2$



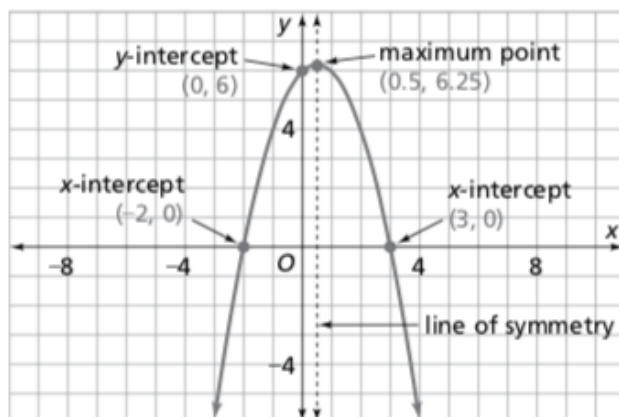
$$\begin{aligned}
 4. \quad y &= x^2 + 9x + 20 \\
 &= x^2 + 4x + 5x + 20 \\
 &= x(x + 4) + 5(x + 4) \\
 &= (x + 5)(x + 4)
 \end{aligned}$$

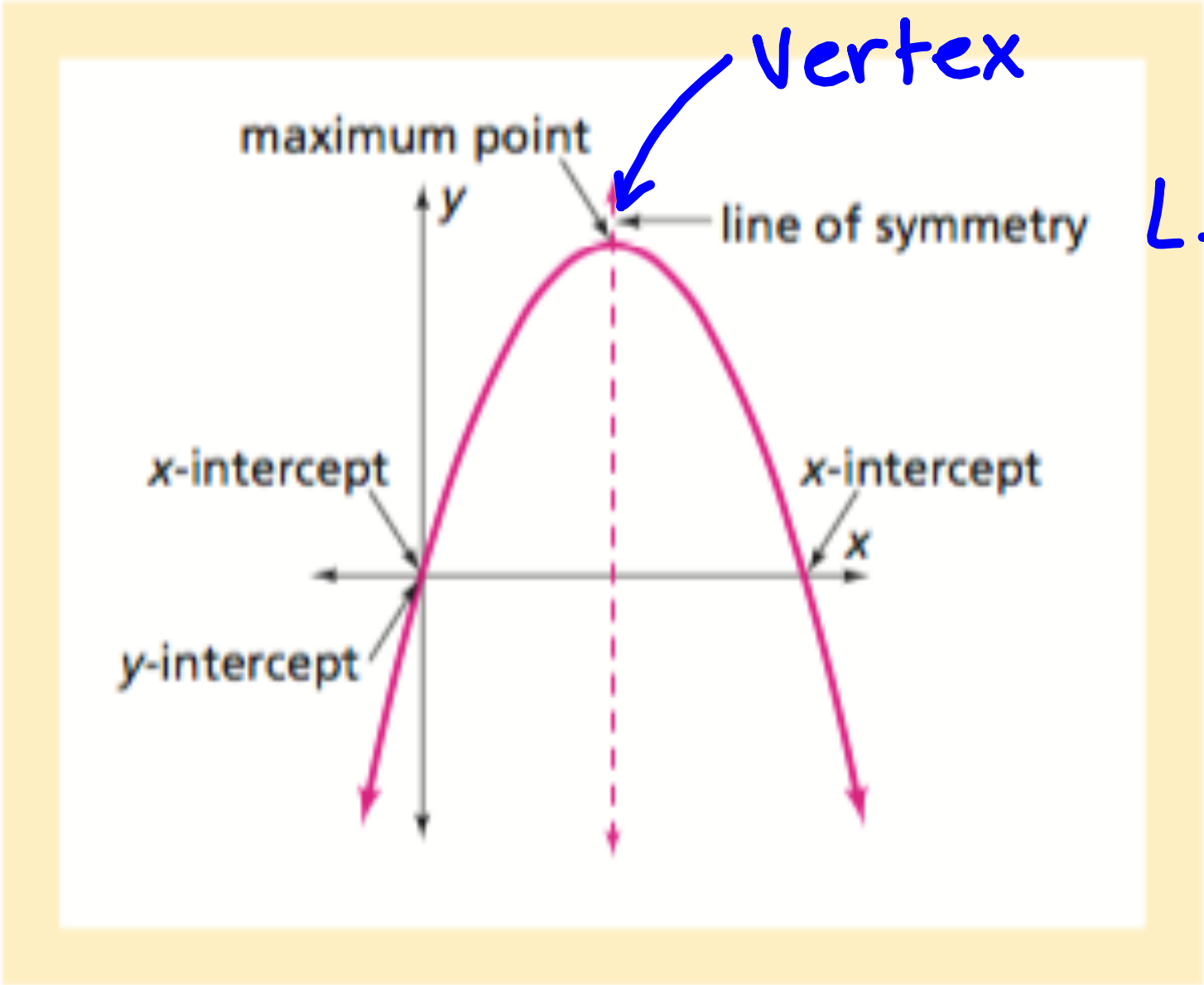


$$\begin{aligned}
 5. \quad y &= x^2 + 5x - 14 \\
 &= x^2 - 2x + 7x - 14 \\
 &= x(x - 2) + 7x(x - 2) \\
 &= (x + 7)(x - 2)
 \end{aligned}$$



$$\begin{aligned}
 6. \quad y &= (3 - x)(2 + x) \\
 &= 6 + 3x - 2x - x^2 \\
 &= 6 + x - x^2
 \end{aligned}$$





Vertex

L.O.S.

Key Features of Parabolas

x-intercept(s)

y-intercept

L.O.S.

Vertex

Open up or down

How do we find the y-intercept?

We know the y-intercept is ... *the value of y when x = 0.*

Let's find it using ...

Expanded Form: $y = x^2 + 7x + 10$

$$y = 0^2 + 7(0) + 10 \quad (0, 10) \\ = 10$$

Factored Form: $y = (x + 2)(x + 5)$

$$y = (0 + 2)(0 + 5) \quad (0, 10) \\ = (2)(5) \\ = 10$$

If we have $y = ax^2 + bx + c$ — y-int

Linear: $y = mx + b$ — y-int

THE CONSTANT
is always the y-intercept 😊

How do we find the x-intercept(s)?

We know the x-intercept is ... *the value of x when $y=0$.*

Let's find them using ...

Expanded Form: $y = x^2 + 7x + 10$

$$0 = x^2 + 7x + 10$$

*yikes!
Can't do
this ;)*

Factored Form: $y = (x + 2)(x + 5)$

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

*one of these factors
must = 0!*

←
 $x+2=0$ OR

↘
 $x+5=0$

Zero Product Property ZPP

If $a \cdot b = 0$... we know $a=0$, $b=0$,
or a and b both = 0.

Let's try this with ...

Expanded Form: $y = x^2 + 7x + 10$

$$0 = x^2 + 7x + 10 \quad \text{Can't use ZPP here.}$$

Factored Form: $y = (x + 2)(x + 5)$

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

$(-2, 0)$
 $(-5, 0)$

$0 = x + 2$
 $\begin{array}{r} -2 \quad -2 \\ \hline -2 = x \end{array}$

$0 = x + 5$
 $\begin{array}{r} -5 \quad -5 \\ \hline -5 = x \end{array}$

Best form for finding x-intercepts?

FACTORED FORM!

How do we find the Line of Symmetry?

We know ... it is halfway between the x-intercepts.

How can we use what we know to calculate this?

We can use our x-intercepts $(-2, 0)$; $(-5, 0)$

and find the average of the x-values

$$\frac{-2 + -5}{2} = \frac{-7}{2} = -3.5$$

$$\boxed{x = -3.5} \quad \text{L.O.S.}$$

How do we find the vertex?

We know the vertex is ... *on the L.O.S.*
so we already know the x-value.

Let's find it using ...

Expanded Form: $y = x^2 + 7x + 10$

$$\begin{aligned} y &= (-3.5)^2 + 7(-3.5) + 10 \\ &= -26.75 \end{aligned}$$

WRONG!
Not using
calculator
correctly ;)

Factored Form: $y = (x + 2)(x + 5)$

Vertex:
 $(-3.5, -2.25)$

$$\begin{aligned} y &= (-3.5 + 2)(-3.5 + 5) \\ &= (-1.5)(1.5) \\ &= -2.25 \end{aligned}$$

Best form for calculating the vertex?

Factored

(though BOTH should work)

How does the value of 'a' affect the parabola?

Use Desmos to graph the following:

$$y = x^2$$

$$y = -x^2$$

$$y = 3x^2$$

$$y = -3x^2$$

$$y = 0.5x^2$$

$$y = -0.5x^2$$

What about the parabola does 'a' control?

Opening up or down : $a > 0$, opens up
 $a < 0$, opens down

Width of the parabola: $|a|$ large \rightarrow narrow
 $|a|$ small \rightarrow wide

What information can we get about a parabola from the different forms of the equation?

Expanded Form: $y = ax^2 + bx + c$

a — open up/down
wide/narrow

c — y-int.

Factored Form: $y = (x + d)(x + e)$

Product = y-int

use Zero Product Property to find x-intercept(s)

Homework

Page 41, #'s 51-53, 69