Before Class:

☐ Read the objectives on page 640.

☐ Read the Helpful Hint boxes on pages 641 and 644.

☐ Complete the exercises:

1. The graph of \( y = x^2 \) is a smooth curve called a __________________________.

2. The graph of \( y = x^2 \) is symmetric about the _______ - axis.

3. For the graph of \( y = ax^2 + bx + c \),
   
   if \( a \) is positive, the graph opens __________________________;
   
   if \( a \) is negative, the graph opens __________________________.

During Class:

☐ Write your class notes. Neatly write down all examples shown as well as key terms or phrases with definitions. If not applicable or if you were absent, watch the Lecture Series (DVD) for this section and do the same (write down the examples shown as well as key terms or phrases). Insert more paper as needed.

<table>
<thead>
<tr>
<th>Class Notes/Examples</th>
<th>Your Notes</th>
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Answers: 1) parabola 2) \( y \) 3) upward; downward
Section 10.4 Graphing Quadratic Equations

Class Notes (continued) | Your Notes

(Insert additional paper as needed.)
Practice:

☐ Complete any incomplete exercises below. Check and correct your work using the answers and references at the end of this section.

Review this example:

1. Graph: \( y = -2x^2 \)

Select \( x \)-values and calculate the corresponding \( y \)-values. Plot the ordered pairs found. Then draw a smooth curve through those points.

When the coefficient of \( x^2 \) is negative, the corresponding parabola opens downward. When a parabola opens downward, the vertex is the highest point of the parabola. The vertex of this parabola is \((0,0)\) and the axis of symmetry is the \( y \)-axis.

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Your turn:

2. Graph \( y = 2x^2 \) by finding and plotting ordered pair solutions.

Review this example:

3. Graph: \( y = x^2 - 6x + 8 \)

In the equation \( y = x^2 - 6x + 8 \), \( a = 1 \) and \( b = -6 \). The \( x \)-coordinate of the vertex is

\[
x = \frac{-b}{2a} = \frac{-(-6)}{2 \cdot 1} = 3.
\]

To find the corresponding \( y \)-coordinate, let \( x = 3 \) in the original equation.

\[
y = x^2 - 6x + 8 = 3^2 - 6 \cdot 3 + 8 = -1
\]

The vertex is \((3,-1)\) and the parabola opens upward since \( a \) is positive.

(solution continued on the next page)

Your turn:

4. Sketch the graph of \( y = 2x^2 - 11x + 5 \). Label the vertex and the intercepts.
Section 10.4 Graphing Quadratic Equations

To find the x-intercepts, we let $y = 0$.

$$0 = x^2 - 6x + 8 = (x - 4)(x - 2)$$

The x-intercepts are $(4,0)$ and $(2,0)$.

If we let $x = 0$ in the original equation, then $y = 8$ and the y-intercept is $(0,8)$. Now we plot the vertex $(3,-1)$ and the intercepts $(4,0)$, $(2,0)$, and $(0,8)$. Then we can sketch the parabola.

### Review this example:

5. Graph: $y = x^2 + 2x - 5$

In the equation $y = x^2 + 2x - 5$, $a = 1$ and $b = 2$.

Using the vertex formula, we find that the x-coordinate of the vertex is

$$x = \frac{-b}{2a} = \frac{-2}{2 \cdot 1} = -1.$$

The y-coordinate of the vertex is

$$y = (-1)^2 + 2(-1) - 5 = -6$$

Thus, the vertex is $(-1,-6)$.

To find the x-intercepts, we let $y = 0$.

$$0 = x^2 + 2x - 5$$

This cannot be solved by factoring, so we use the quadratic formula.

(solution continued on the next page)

### Your turn:

6. Sketch the graph of $y = -x^2 + 4x - 3$. Label the vertex and the intercepts.
Section 10.4 Graphing Quadratic Equations

The $x$-intercepts are $(-1 + \sqrt{6}, 0)$ and $(-1 - \sqrt{6}, 0)$.

We use a calculator to approximate these so that we can easily graph these intercepts. $-1 + \sqrt{6} \approx 1.4$ and $-1 - \sqrt{6} \approx -3.4$

To find the $y$-intercept, we let $x = 0$ in the original equation and find that $y = -5$. Thus the $y$-intercept is $(0, -5)$. 

\[ x = \frac{-2 \pm \sqrt{2^2 - 4(1)(-5)}}{2 \cdot 1} \]
\[ x = \frac{-2 \pm \sqrt{4}}{2} \]
\[ x = \frac{-2 \pm 2}{2} \]
\[ x = \frac{2(-1 \pm \sqrt{6})}{2} = -1 \pm \sqrt{6} \]
Next, insert your homework. Make sure you attempt all exercises asked of you and show all work, as in the exercises above. Check your answers if possible. Clearly mark any exercises you were unable to correctly complete so that you may ask questions later. DO NOT ERASE YOUR INCORRECT WORK. THIS IS HOW WE UNDERSTAND AND EXPLAIN TO YOU YOUR ERRORS.