Section 1.3
Graphing Equations

Let it snow! Let it snow! Let it snow!

The arrival of snow can range from light flurries to a full-fledged blizzard.
Snow can be welcomed as a beautiful backdrop to outdoor activities
or it can be a nuisance and endanger drivers.

We will look at how graphs can be used to explain
both mathematical concepts and everyday situations.
Specifically, in the application exercises of this section
of the textbook, you will match stories of varying
snowfalls to the graphs that explain them.

First Steps:

☐ **Take comprehensive notes** from your instructor's lecture and insert your notes into this section of the *Learning Guide*. Be sure to write down all examples, definitions, and other key concepts. Additional learning resources include the *Lecture Series on DVD*, the *PowerPoints*, and Section 1.3 of your textbook which begins on page 30.

☐ Complete the *Concept and Vocabulary Check* on page 36 of the textbook.
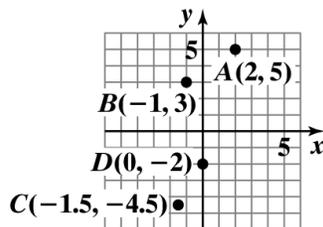
Guided Practice:

☐ Review each of the following *Solved Problems* and complete each *Pencil Problem*.

Objective #1: Plot points in the rectangular coordinate system.

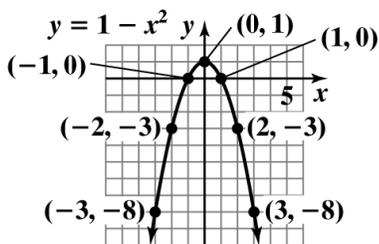| ✔ *Solved Problem #1*	✎ *Pencil Problem #1* ✎
1. Plot the points: $A(2,5)$, $B(-1,3)$, $C(-1.5,-4.5)$, and $D(0,-2)$.	1. Plot the points: $A(1,4)$, $B(-2,3)$, $C(4,-1)$, and $D(-4,0)$.

Objective #2: Graph equations in the rectangular coordinate system.

✔ *Solved Problem #2* | ✎ *Pencil Problem #2* ✎

2a. Graph $y = 1 - x^2$.

x	$y = 1 - x^2$	(x, y)
–3	$y = 1 - (-3)^2 = -8$	$(-3, -8)$
–2	$y = 1 - (-2)^2 = -3$	$(-2, -3)$
–1	$y = 1 - (-1)^2 = 0$	$(-1, 0)$
0	$y = 1 - (0)^2 = 1$	$(0, 1)$
1	$y = 1 - (1)^2 = 0$	$(1, 0)$
2	$y = 1 - (2)^2 = -3$	$(2, -3)$
3	$y = 1 - (3)^2 = -8$	$(3, -8)$

2a. Graph $y = x^2 - 4$. Let $x = -3, -2, -1, 0, 1, 2,$ and 3.

2b. Graph $y = |x + 1|$.

| x	$y = |x + 1|$	(x, y)
–4	$y = |-4 + 1| = |-3| = 3$	$(-4, 3)$
–3	$y = |-3 + 1| = |-2| = 2$	$(-3, 2)$
–2	$y = |-2 + 1| = |-1| = 1$	$(-2, 1)$
–1	$y = |-1 + 1| = |0| = 0$	$(-1, 0)$
0	$y = |0 + 1| = |1| = 1$	$(0, 1)$
1	$y = |1 + 1| = |2| = 2$	$(1, 2)$
2	$y = |2 + 1| = |3| = 3$	$(2, 3)$
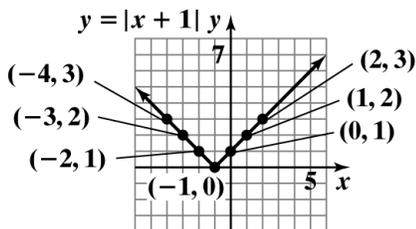
2b. Graph $y = 2|x|$. Let $x = -3, -2, -1, 0, 1, 2,$ and 3.

Objective #3:
Use the rectangular coordinate system to visualize relationships between variables.

✔ Solved Problem #3

3. When a physician injects a drug into a patient's muscle, the concentration of the drug in the body, measured in milligrams per 100 milliliters, depends on the time elapsed after the injection, measured in hours. The following figure shows the graph of drug concentration over time, where x represents hours after the injection and y represents the drug concentration at time x.
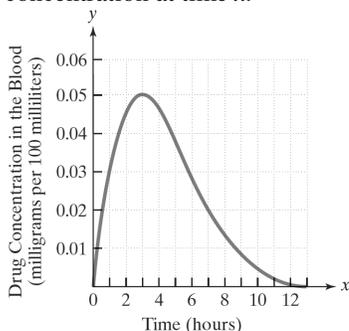
Use the figure to answer the following questions.

3a. During which period of time is the drug concentration increasing?

The drug concentration is increasing from 0 to 3 hours.

3b. During which period of time is the drug concentration decreasing?

The drug concentration is decreasing from 3 to 13 hours.

3c. What is the drug's maximum concentration and when does this occur?

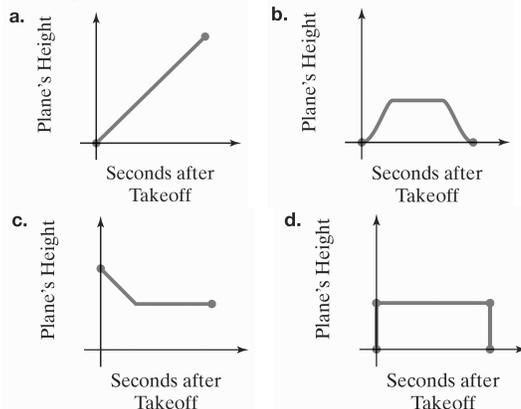The drug's maximum concentration is 0.05 milligram per 100 milliliters, which occurs after 3 hours.

3d. What happens by the end of 13 hours?

None of the drug is left in the body.

✎ Pencil Problem #3✎

3. Select the graph that best illustrates the story:

An airplane flew from Miami to San Francisco.

> *Objective #4:* Interpret information about a graphing utility's viewing rectangle or table.

| ✔ *Solved Problem #4*	✎ *Pencil Problem #4*✎
4. What is the meaning of a [-100, 100, 50] by [-100, 100, 10] viewing rectangle?	**4.** What is the meaning of a [-20, 80, 10] by [-30, 70, 10] viewing rectangle?

The minimum *x*-value is –100, the maximum *x*-value is 100, and the distance between consecutive tick marks is 50.

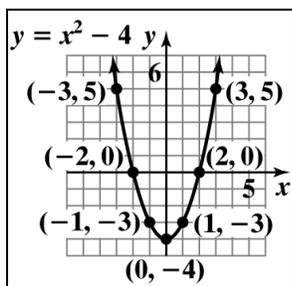The minimum *y*-value is –100, the maximum *y*-value is 100, and the distance between consecutive tick marks is 10.

Answers for Pencil Problems *(Textbook Exercise references in parentheses)*:
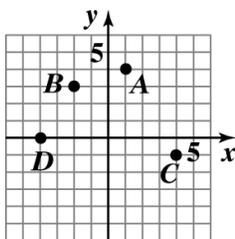
1.   *(1.3 #1-9)*
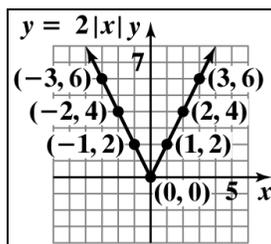
2a.   *(1.3 #11)*   **2b.**   *(1.3 #21)*

3. graph b   *(1.3 #61)*

4. The minimum *x*-value is –20, the maximum *x*-value is 80, and the distance between consecutive tick marks is 10. The minimum *y*-value is –30, the maximum *y*-value is 70, and the distance between consecutive tick marks is 10. *(1.3 #29)*

Homework:

☐ **Review the Section 1.3 summary** on page 94 of the textbook.

☐ **Insert your homework** into this section of the *Learning Guide*. Show all work neatly and check your answers. Strive to work through difficulties when possible, making note of any exercises where you need additional help. Remember, even if your instructor assigns homework through *MyMathLab*, you should still write out your work.