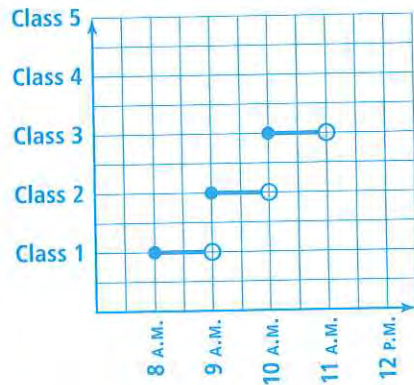


MODEL & DISCUSS

Cleo takes three 1-hour classes at a community college. The graph shows the time she spends in each class.



- A. Next semester, each class will start an hour later. How will this change the graph?
- B. How will the graph change if she takes two 90-minute classes, one starting at 8:30 A.M. and the second at 10:00 A.M.?
- C. **Construct Arguments** Starting in the fall, Cleo will take three classes in a row with the first starting at 7:00 A.M. Cleo says that she can update the graph by moving all three steps one unit to the left. Do you agree? Justify your answer. © MP.3

HABITS OF MIND

Look for Relationships What have you learned about graphing functions that is useful in analyzing this problem? © MP.7

EXAMPLE 1  **Try It! Translate Step Functions**

1. How will the total points awarded for a \$1.25 juice drink change if the bonus points are decreased by 2 points?

EXAMPLE 2  **Try It! Vertical Translations of the Absolute Value Function**

2. For each function, identify the vertex and the axis of symmetry.

- a. $p(x) = |x| + 3$

- b. $g(x) = |x| - 2$

HABITS OF MIND

Generalize What did you notice about the equations of step and absolute value functions that result in vertical translations?  **MP.8**

EXAMPLE 3  **Try It! Horizontal Translations of the Absolute Value Function**

3. For each function, identify the vertex and the axis of symmetry.

- a. $g(x) = |x - 3|$

- b. $p(x) = |x + 5|$

**EXAMPLE 4** **Try It! Understand Vertical and Horizontal Translations**

4. Find the vertex of the graph of each function.

a. $g(x) = |x - 1| - 3$

b. $g(x) = |x + 2| + 6$

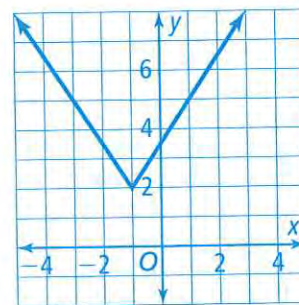
HABITS OF MIND**Reason** How is the algebraic representation of a function that translates the graph of $f(x) = |x|$ horizontally different from one that translates the graph of f vertically? © MP.2**EXAMPLE 5** **Try It! Understand Vertical Stretches and Compressions**5. Compare the graph of each function with the graph of $f(x) = |x|$.

a. $g(x) = 3|x|$

b. $g(x) = -\frac{1}{3}|x|$

EXAMPLE 6 **Try It! Understand Transformations of the Absolute Value Function**

6. a. Write a function for the graph shown.



b. Write the function of the graph after a translation 1 unit right and 4 units up.

HABITS OF MIND**Use Structure** How can you use the symmetric structure of the graph of $g(x) = a|x - h| + k$ to help you graph the function? Explain. © MP.7

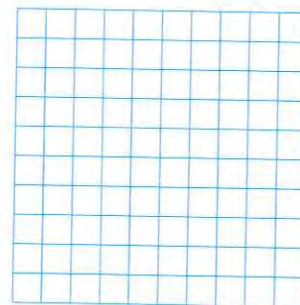
Do You UNDERSTAND?

- ESSENTIAL QUESTION** How do the constants affect the graphs of piecewise-defined functions?
- Generalize** How do the constants a , h , and k affect the domain and range of $g(x) = a|x - h| + k$ when $a > 0$? © MP.8
- Error Analysis** Jacy says that $f(x) = 4|x - 1|$ and $f(x) = |4x - 1|$ have the same graph. Is Jacy correct? Explain. © MP.3
- Use Structure** How can you reflect the graph of $f(x) = 3|x + 2| + 1$ across the x -axis? © MP.7

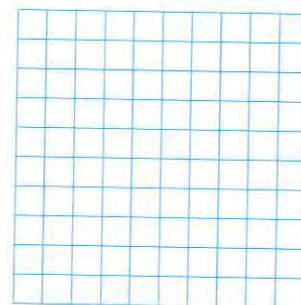
Do You KNOW HOW?

Find the vertex and graph each function.

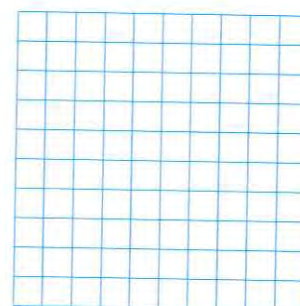
5. $f(x) = |x| + 2.5$



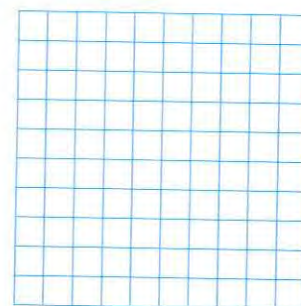
6. $f(x) = |x + 2.5|$



7. $f(x) = |x - 2| + 4$



8. $f(x) = -3|x + 1| - 5$



9. What is the equation of the graph?

