Appendix M:
Slope of a Line

TERMINOLOGY — APPENDIX M

For each of the following terms, provide 1) a definition in your own words, 2) the formal definition (as provided by your text or instructor), and 3) an example of the term using a drawing or problem. A sample filled-out form is available in the Introduction.

Slope

Your definition	
Formal definition	
Example	

Undefined Slope

Your definition	
Formal definition	
Example	

Slope-Intercept Form

Your definition	
Formal definition	
Example	

1. Give three real-world examples of items that have a slope.

Student answers will vary. Sample answers might include:
1) Roads in the mountains
2) Sidewalk ramps
3) Dentist's chairs

2. Without using a formula, how would you determine the slope of a line drawn on the rectangular coordinate plane?

Start at a point on the line. Move 1 unit horizontally. If you must move up to intersect the line, the distance you move is the slope of the line; if you must move down to intersect the line, the negative of the distance you move is the slope of the line.

3. What are *subscripted terms*?

Subscripted terms are terms that are labelled with small numbers to the left and down from the letter. For example, $2y_1$, read: 2 times *y* sub one, is a subscripted term.

4. What letter is commonly used for slope in equations?

The letter *m* is commonly used for the slope in equations.

5. How do you determine if the slope of a line is positive or negative?

If the line rises from left to right the slope is positive. If the line falls from left to right, the slope is negative.

6. What is the slope of any horizontal line?

The slope of any horizontal line is zero.

7. What is the slope of any vertical line?

The slope of any vertical line is undefined. We say that the line has no slope.

8. What form of an equation allows you to easily determine the slope and y-intercept of its line?

The y-intercept form of the line: $y = mx + b$

9. What is the slope of the line represented by the equation $y = \frac{3}{4}x + 15$? **3/4**

10. What is the y-intercept of the line represented by the equation in question 9? **(0, 15)**

CRITICAL THINKING QUESTIONS — APPENDIX M

1. How are the words *rise*, *run* and *slope* related?

   The slope is equal to the rise over run: $slope = \frac{rise}{run}$

2. Considering only those cases where $x_1 \neq x_2$ and $y_1 \neq y_2$, if you subtract the values for y and x in reverse orders when calculating slope, will your answer still be correct? Why or why not?

   Yes, the answer will be correct: $\frac{y_2 - y_1}{x_2 - x_1} = \frac{-1}{-1} \cdot \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_1 - y_2}{x_1 - x_2}$

3. If asked to formulate a general rule for the relationship of the two resulting lines in Question 2 above, how would you respond?

   The lines are the same. In calculating the slope, make sure that you subtract the coordinates in the same order for both the numerator and the denominator.

4. Compare the visible incline or decline of two lines with slopes of 2 and $\frac{1}{2}$, respectively. What general rule can you formulate about the slope of a line based on the value of m?

   If the slope is positive, the larger the number, the steeper the slope.

5. What happens to the graph of a given line if you change only the value of m?

   The line's slope changes, but its *y*-intercept remains the same.

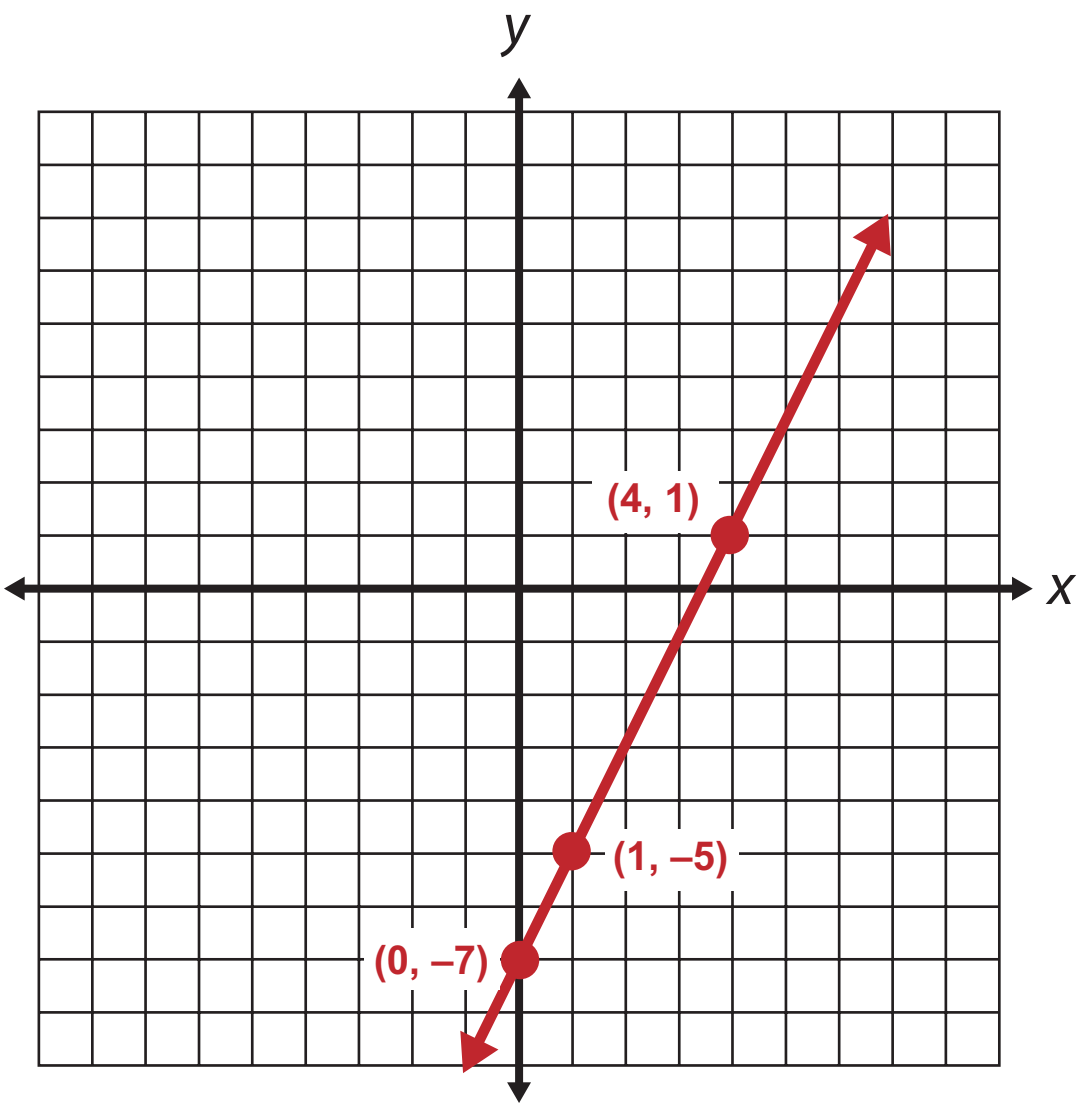
6. What happens to the graph of a given line if you change only the value of b?

   The y-intercept changes, but the slope remains the same.

7. When looking at the equation for a line in slope-intercept form, how can you tell if it will pass through the origin?

   The line will pass through the origin if the *y*-intercept is zero, that is to say, the constant does not appear in the equation.

1. a) On the grid below, graph the line for the equation $y = 2x - 7$ using the slope-intercept method.



b) On the same graph, plot the coordinates (1, –5) and (4, 1).

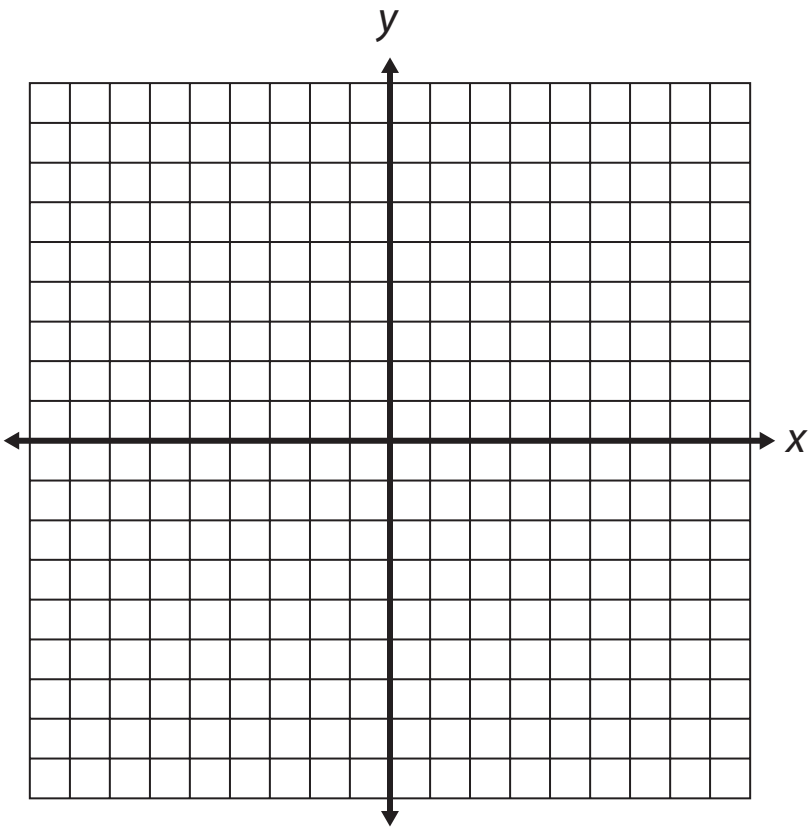
c) What is the relationship of these two coordinates to the line?

These points are on the line and they also satisfy the equation.

2. If another student asked you how to graph a line for an equation given in the slope-intercept format, how would you respond?

Graph the y-intercept by placing a point on the y-axis whose second coordinate is the constant in the equation. Then move left or right from that point the denominator of the slope and up or down the numerator of the slope. If a number is positive, you move up or right. If it is negative, you move down or left. If the slope is an integer, rewrite it as a fraction with denominator 1 and proceed as stated.

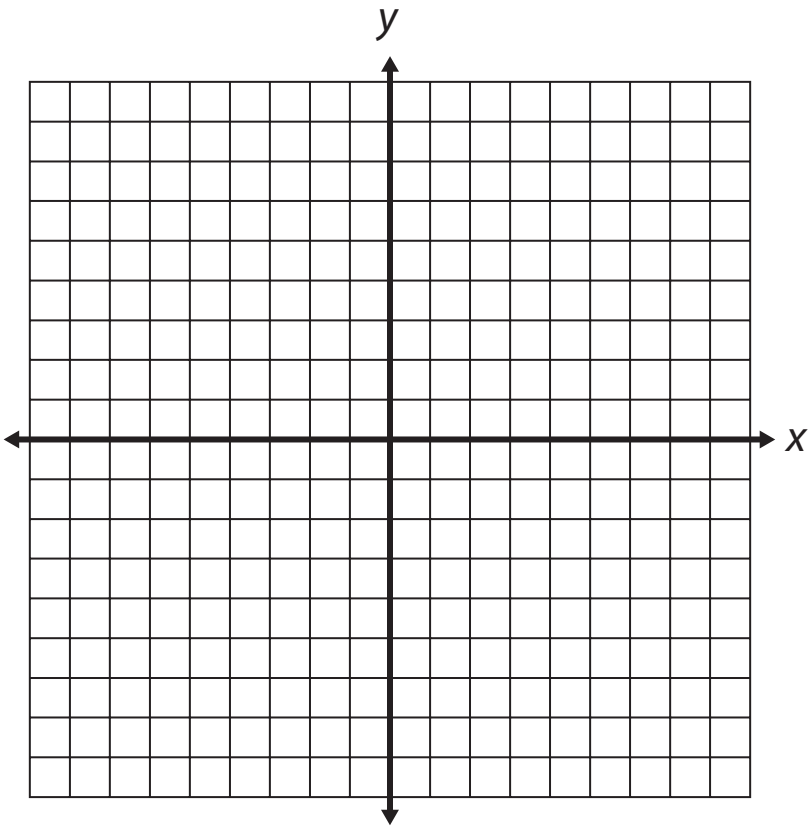
3. Write an equation for a line with zero slope. Graph the line.



equation:

Student answers will vary, as will their graphs. All equations must be in the format *y* = c, where c is any constant. This is a horizontal line and the graphed line must be horizontal, at value c.

4. Write an equation for a line with an undefined slope. Graph the line.



equation:

Student answers will vary, as will their graphs. All equations must be in the format *x* = c, where c is any constant. This is a vertical line and the graphed line must be vertical, at value c.

IDENTIFY AND CORRECT THE ERRORS — APPENDIX M

Identify the error(s) you find in each of the following worked solutions. Describe the error made and solve the problem correctly in the appropriate spaces provided.

Problem	Describe Error	Correct Process
1. Write an equation for a line, in *standard form*, with the given slope and y-intercept: slope: $\frac{1}{3}$ y-intercept: (0, –1) **Worked Solution** *(What is wrong here?)* $\frac{1}{3}x + y = -1$	**Student 'plugged in' the values for the slope and y-intercept to the standard form equation. This can only be done with the point-slope form of the equation. Student should have done that and then manipulated the point-slope equation into the standard form.**	Substitute the values into the point-slope form: $y = \frac{1}{3}x - 1$ The x-term must be on the left side. Subtract $\frac{1}{3}x$ from both sides of the equation. $-\frac{1}{3}x + y = -1$
Problem	**Describe Error**	**Correct Process**
2. Determine the slope of the line that passes through the given points: (2, 4) and (1, –6) **Worked Solution** *(What is wrong here?)* $\frac{4-(-6)}{1-2}$ $= \frac{10}{-1}$ $= -10$	**Student did not subtract the coordinates in the correct order. If the numerator was constructed with the first ordered pair coordinate first, then the denominator must also use the first ordered pair coordinate first as well.**	$\frac{4-(-6)}{2-1} = \frac{10}{1} = 10$