**Slope-Intercept Form**

From your Algebra I class and our work last week you know that linear functions can be written in *slope-intercept form*:  
 *y* = *mx* + *b*

*f*(*x*) = *mx* + *b*

* You should also remember that every line has a number called the *slope*. It’s a measure of how steep the line is.   
  Given the coordinates of two points, the formula for calculating slope is   
   *m* = .
* Also you know that the graph of the line has its *y*-intercept at the point x=0, y=b.
* Point-Slope Form
* There is another very useful form in which to write a linear equation: linear functions can be written in *point-slope form*:
* *y* = *m*(*x* – *h*) + *k*
* *f(x)= m*(*x* – *h*) + *k*
* where *m* is the slope and(*h*, *k*) are the coordinates of any point of the line.

**Class Examples (point-slope form):**

Write a formula in point-slope form for the line through (40, 500) and (70, 1100).

* First calculate the slope:



* Use this slope together with one of the given points: Let’s choose: (40, 500)
* Take the equation form f(x) = m(x – h ) + k and put in the known information:

f(x) = 20(x – 40) + 500.

**You try it:**

Write function formulas in point-slope form, *f*(*x*) = *m*(*x* – *h*) + *k*, fitting the given information.

**1.** Linear function with a slope of  and including the point (–4, 7)

**2.** Linear function including the points (5, –3) and (1, –9)

**3.** Linear function that has function values *f*(–2) = 4 and *f*(2) = 5.

**Graphing equations in point-slope form:**

**Summary:**

*To graph f*(*x*) = *m*(*x* – *h*) + *k* (“point-slope form”)

* First draw a point at (*h*, *k*).
* Take the slope *m* and use *m* =  to identify a *rise* and a *run* that you can use.
* From your original point, move to the right by the *run* and up or down by the *rise* (up if the rise is positive, down if the rise is negative). Draw a second point.
* Repeat the process to draw more points. After you’ve located several points, use a ruler to draw the line.

**Note**: this is the same as the graphing methods you are familiar with except for where the first point is drawn. For slope-intercept form, you start from a point on the *y*-axis. For point-slope form, the point you start from could be anywhere.

### You try it

**1.** Graph these functions.

|  |  |
| --- | --- |
| **a.** *f*(*x*) = –(*x -* 2) + 3 | **b.** *f*(*x*) = –(*x* + 1) + 2 |
|  |  |

**Linear Functions (Point-slope and slope-intercept): Homework Problems**

**1.** Write function formulas fitting the given information. Use whichever form requires the least work to get the answer. ***Hint:*** If the *y*-intercept isn’t already given to you somehow, it’s probably easier to use point-slope.

**a.** linear function including the points (0, 10) and (2, 4)

**b.** linear function including the points (–1, 5) and (–3, 6)

**c.** linear function with values *f*(0) = –3 and *f*(5) = 15

**d.** linear function with values *f*(10) = 800 and *f*(30) = 2000

**e.** linear function whose graph has its *x*-intercept at –10 and its *y*-intercept at –2

2. Find the slope of the line passing through each pair of points. Some may not be defined. It may be helpful to plot the two points to make sure the sign of your answer is correct. Then find the equation of the line. Use point-slope form if possible.

a. (3,8) and (7,4)

b. (-2,5) and (1,11)

c. (6,4) and (-3,4)

d. (2,3) and (-2,-3)

e. (-5,-1) and (-2,-6)

3. In each case below, is a linear function. Write the equation for the function. Hint: Identify two points that are on the line.

a. 

b. 

c. 8 is the zero of  and 

d. The *x*-intercept is -4 and the *y*-intercept is 2

4. Graph these functions that are given in point-slope form.

|  |  |
| --- | --- |
| **a.** *f*(*x*) = | **b.** *f*(*x*) = |
|  |  |
| **c.** *f*(*x*) = | **d.** *f*(*x*) = 3(*x* – 1) – 4 |
|  |  |
| **e.** *f*(*x*) = –4(*x* + 2) + 5 | **f.** *f*(*x*) = –(*x* + 2) |
|  |  |

**5.** Write function formulas for these lines, using the marked point. (If the marked point is on the *y*-axis, use slope-intercept form. Otherwise, use point-slope form.)

|  |  |
| --- | --- |
| **a.** *f*(*x*) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | **b.** *f*(*x*) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  |  |
| **c.** *f*(*x*) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | **d.** *f*(*x*) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  |  |
| **e.** *f*(*x*) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | **f.** *f*(*x*) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  |  |

**6.** Write function formulas for these lines, choosing a point *that has whole-number coordinates*. (If the *y*-intercept isn’t a whole number, pick a different point and use point-slope.)

|  |  |
| --- | --- |
| **a.** *f*(*x*) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | **b.** *f*(*x*) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  |  |
| **c.** *f*(*x*) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | **d.** *f*(*x*) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  |  |
| **e.** *f*(*x*) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | **f.** *f*(*x*) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  |  |