Math 6e: Homework 15

HW#15 is due January 21; submit to Google Classroom 15 minutes before class.

Please, write clearly which problem you are solving and show all steps of your solution.

Equation and graph of a line

A function is a rule that tells us how to calculate the y coordinates of points from the x coordinate; a general notation of a function is $y = f(x)$ (reads y is a function of x). The relation is given in the form of an equation. **To draw a graph** of an equation, choose a set of points x and find the corresponding y values. Draw the points on a graph and connect them with a line.

Equation of a line

The line equation is usually written as: $\boldsymbol{y = mx + b}$

Where b is the intercept (the value of y when $x = 0$)

Where m is the 'slope' (for a straight line, how steep is the line).

$$slope = \frac{rise\ (change\ in\ y)}{run\ (change\ in\ x)}$$

(The changes in x and y are evaluated from the same pair of points.)

Note: You can use different letters for the slope and intercept

Distance between two points

The distance (d) between two points with coordinates (x_1, y_1) and (x_2, y_2)

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Homework questions

To draw a graph *of an equation, choose a set of points x and find the corresponding y values. Draw the points on a graph and use a quadrille (square) sheet of paper. Connect with a line or a smooth curve.*

1. For each of the equations below, draw a graph of a line, then draw the perpendicular line to the one you just drew that passes through the origin (0,0). Write the equation of the perpendicular line.

   a) $y = 2x$
   b) $y = 3x$
   c) $y = -x$
   d) $y = \frac{1}{2}x$

   Can you determine a general rule: if the slope of a line is k, the slope of its perpendicular is …

2. Draw the graphs of the following functions:
   a) $y = 2|x|$
   b) $y = |x + 1|$

3. Find the distance between the following pairs of points in the plane (You can draw the points in an x/y coordinate system and use the Pythagorean Theorem)
   a) $(0,0)$ and $(1,1)$
   b) $(0,0)$ and $(3,4)$
   c) $(0,0)$ and $(-1,2)$
   d) $(2,2)$ and $(3,3)$
   e) $(2,2)$ and $(0,6)$

4. Important: sketch the graphs of the following functions. Please try sketching this first on your own, using some values for x and calculating the corresponding y values. Then check it with the *graphing calculator* to see the differences. You do not have to include the sketches, but you have to answer the two questions at the end.

   a) $y = (x - 1)^2 + 1$
   b) $y = \frac{1}{x+2} + 1$
   c) $y = \frac{1}{2-x}$
   d) $y = |x|$
   e) (Optional) $y = \frac{x+2}{x+1}$
   f) (Optional) $y = |x + 1| + |x - 1|$

   Question 1: What happens when x is in the denominator? ***Answer with sentence(s).***
   Question 2: What happens when you have absolute value | | around?

5. Open the brackets and collect similar terms:
   a) $2x(a + 2b + 3c) =$
   b) $-3y(a - ay + by) =$
   c) $(a^2 + 2a + 1)(a + 1) =$
   d) $(b^2 - 2b + 1)(b - 1) =$
   e) $(4x - 7y)(4x + 7y) =$
   f) $(6x^2 - y)(7x^2 - 2x - 5) =$