

Math 6d: Homework 14

HW#14 is due January 27; submit to Google classroom 15 minutes before the class time.

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 how 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 a form of an equation. **To draw a graph** of an equation, chose a set of points x and find the corresponding y values. Draw the points on a graph.

Equation of a line

The line equation is usually denoted

$$y = ax + b$$

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

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

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

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

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, chose a set of points x and find the corresponding y values. Draw the points on a graph and use quadrille (square) 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 going through the origin $(0,0)$. Write the equation corresponding to 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:
- $y = 2|x|$
 - $y = |x+1|$
3. Find the distance between the following pairs of points in the plane (hint: Pythagorean Theorem)
- (0,0) and (1,1)
 - (0,0) and (3,4)
 - (0,0) and (-1,2)
 - (2,2) and (3,3)
 - (2,2) and (0,6)
4. Sketch graphs of the following functions. Please, try and sketch this first by yourself, then check with the graphing calculator and 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) $y = \frac{x+2}{x+1}$

f) $y = |x + 1| + |x - 1|$

Q1: What happens when x is in the denominator?

Q2: What happens when you have absolute value $| \quad |$ 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) $(6x^2 - y)(7x^2 - 2x - 5) =$