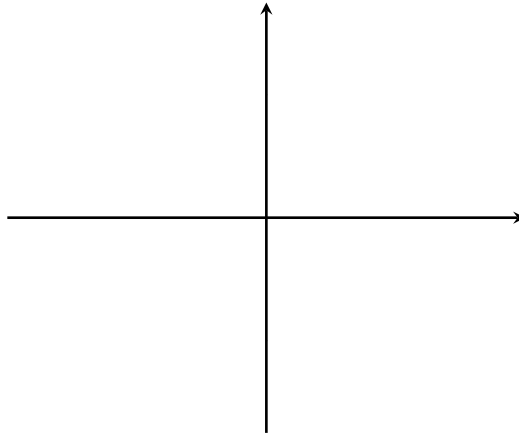


Purpose: In this problem set, you will recall and explore the properties and types of linear functions. We will work with distance and average rate of change.

DISTANCE

1. Given two points x_1 and x_2 on a number line, what is the distance between them?

2. Given two points (x_1, y_1) and (x_2, y_2) , what is the distance between them?
 - (a) Sketch two random points on the coordinate axis below, preferably not in line with each other. Label one (x_1, y_1) and the other (x_2, y_2) .



- (b) Connect the points with a line and sketch a right triangle with that line as the hypotenuse. (Check with Sarah before proceeding.)
- (c) What are the lengths of the legs of the triangle?

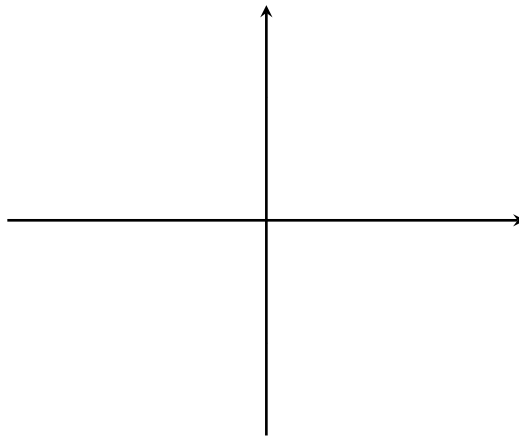
- (d) What is the length of the hypotenuse?

- (e) What is the distance between the two points? This is called the **distance formula**.

MIDPOINT

1. Given two points x_1 and x_2 on a number line, what is the midpoint between them?

2. Given two points (x_1, y_1) and (x_2, y_2) , what is the midpoint between them?
 - (a) Sketch two random points on the coordinate axis below, preferably not in line with each other. Label one (x_1, y_1) and the other (x_2, y_2) .



- (b) Connect the points with a line and sketch a right triangle with that line as the hypotenuse.
- (c) What are the midpoints of the legs of the triangle? (Check with Sarah before proceeding.)

- (d) What is the midpoint of the hypotenuse?

- (e) What is the midpoint between the two points? This is called the **midpoint formula**.

LINES

Definition: The **slope** m between two points (x_1, y_1) and (x_2, y_2) is given by

How are slope and average rate of change related?

Forms of linear functions:

- Point-Slope Form:

 - Slope-Intercept Form:

 - Standard Form:
1. Using our connection between slope and average rate of change, when is a linear function increasing? Give an example of such a line.

 2. When is a linear function decreasing? Give an example of such a line.

PRACTICE

Suppose the two points $(-3, -2)$ and $(3, -10)$ are on the graph of $y = h(x)$.

1. Find the distance between these two points.
2. Find the midpoint between these two points.
3. Find the distance between the midpoint and the point $(-3, -2)$.
4. If $h(x)$ is linear, is the midpoint on the graph of $y = h(x)$?
5. Is the function $h(x)$ increasing? Decreasing?
6. Find the average rate of change between the two points.
7. Find the equation of the line passing between these two points in slope-intercept form and point-slope form.
8. What is the y -intercept of $y = h(x)$? x -intercept?