MA162: Finite mathematics

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University of Kentucky

January 12, 2011

Schedule:

- HW A0 is due Tuesday, Jan 18th, 2011.
- HW A1 is due Monday, Jan 24th, 2011.
- Exam 1 is Monday, Feb 7th, 5:00pm-7:00pm.

Today we will cover graphs, points, lines, and distance (Ch 1.1 - 1.2).

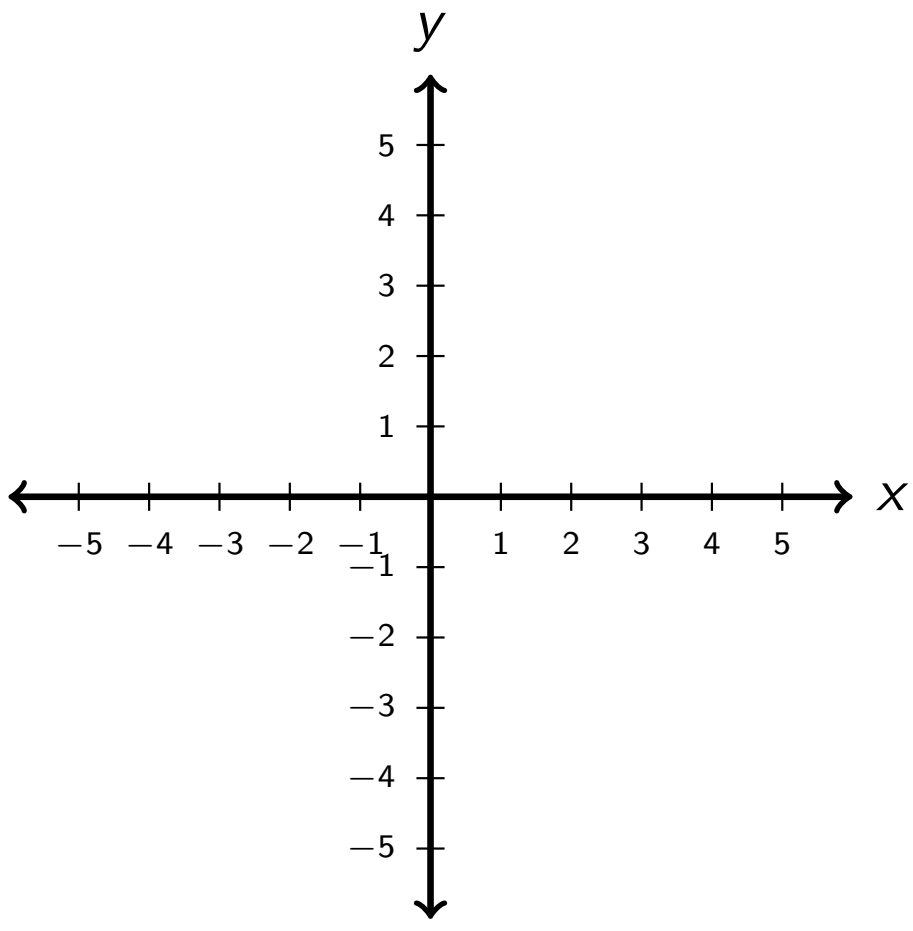
Expectations

- This is a classroom of **courteous** and **professional** peers
- The material is **hard**; if we already knew it, we wouldn't be here
- We are busy people; clear **deadlines** are needed to budget time
- We are part of a common hour course with over 500 students
- We are part of a tradition of several thousand UK students who have mastered this material over the past five years
- Class policies must be consistent across sections and years

Syllabus

- Our time is valuable; clear policies and procedures avoid waste
- The **syllabus** describes the policies and procedures of this course.
- Make sure you are comfortable with the **absence policy**, the **grading policy**, and the **exam dates**.
- Make sure you are committed to handling the **time pressure**:
  - Weekly homework, mandatory, no late work accepted
  - Twice weekly full class meetings, mandatory
  - Weekly small recitation meetings, mandatory
  - Monthly Monday evening exams, mandatory

Section 1.1: Graphs, Points, Distance



We can locate points using two numbers: **coordinates**.

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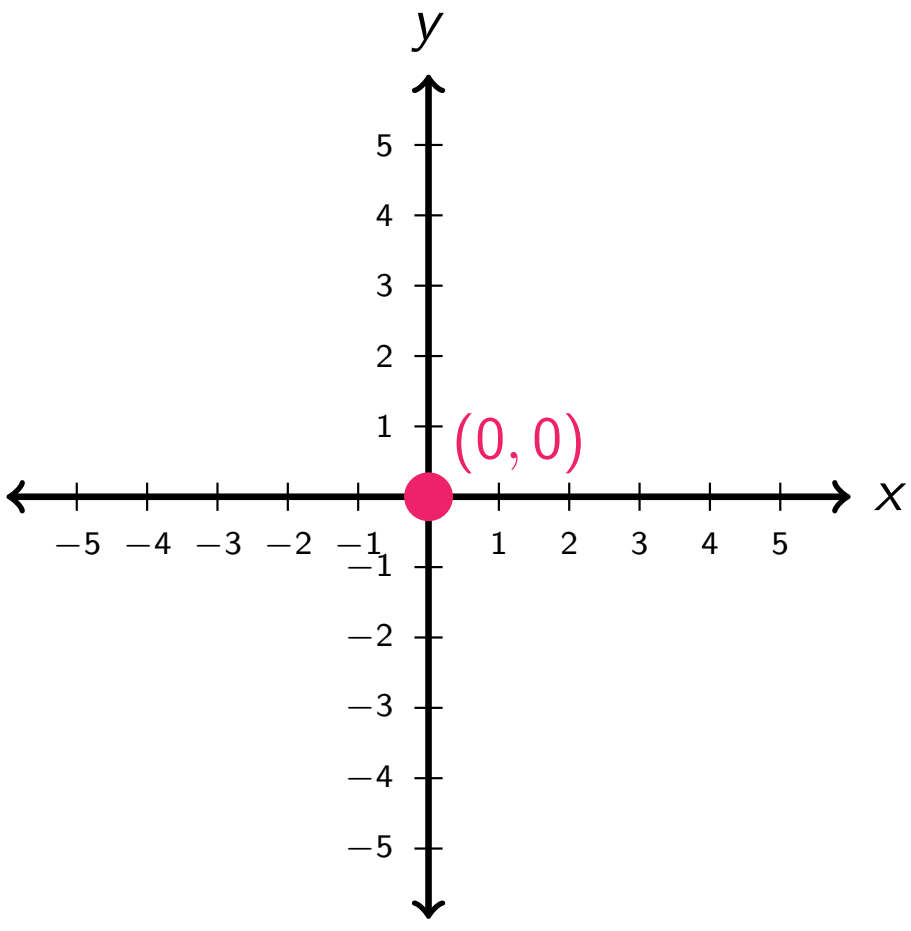
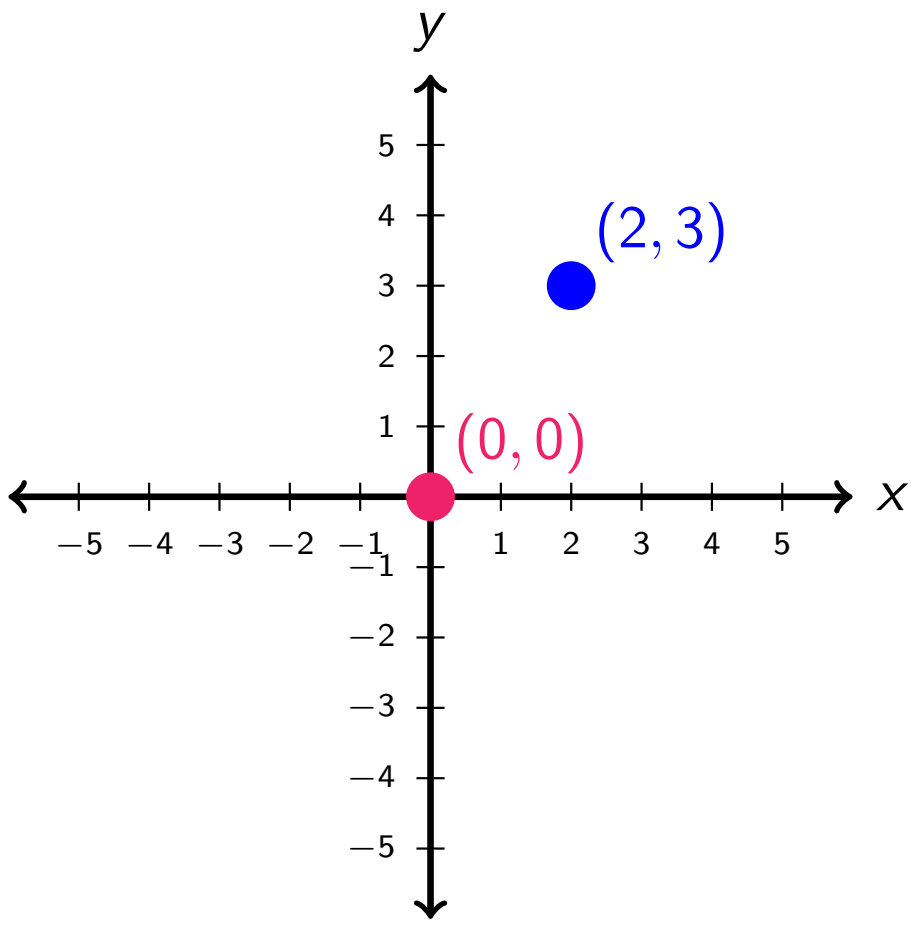


We can locate points using two numbers: **coordinates**.
The place where the lines cross is the **origin**.

Section 1.1: Graphs, Points, Distance



We can locate points using two numbers: **coordinates**.
The point (2,3) is 2 to the right and 3 above the origin.

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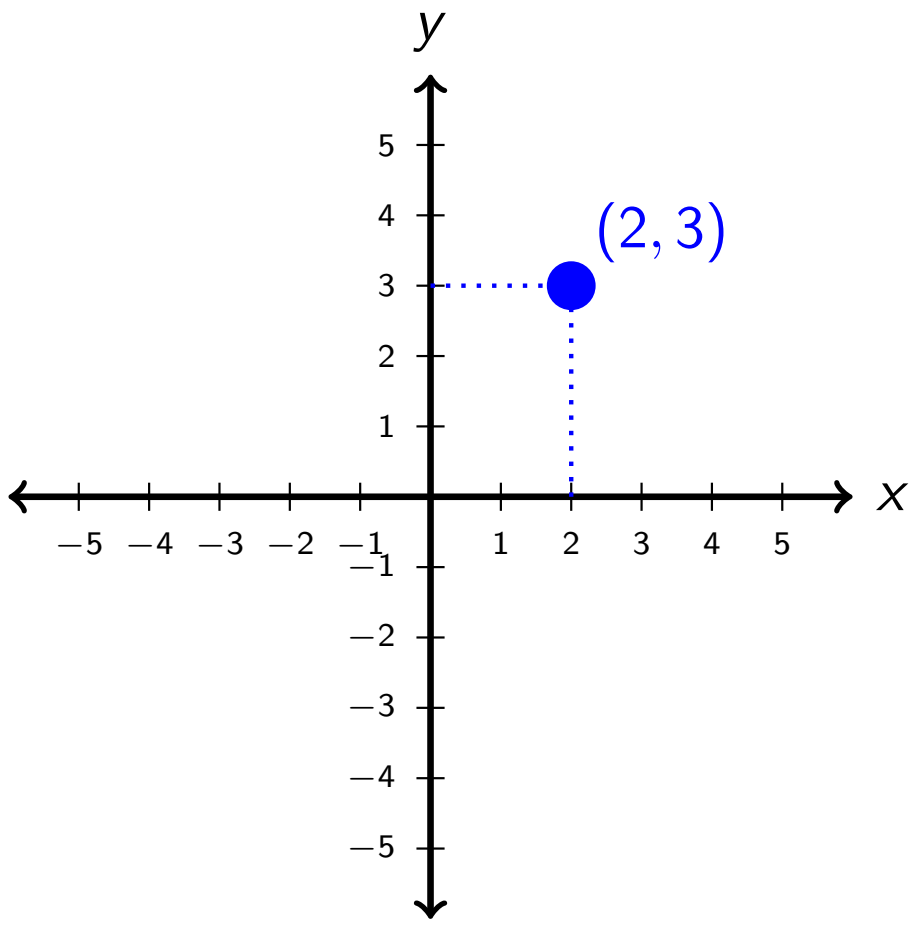

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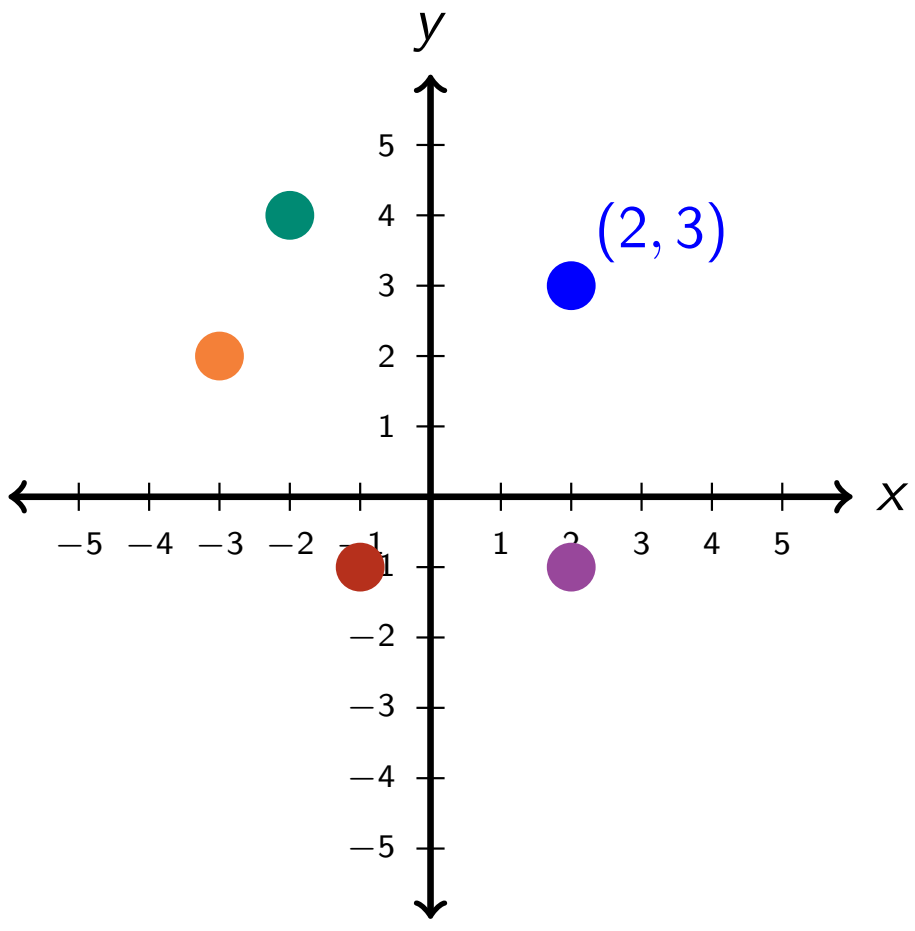

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The point (2,3) is 2 to the right and 3 above the origin.
Which color is (-3,2)?

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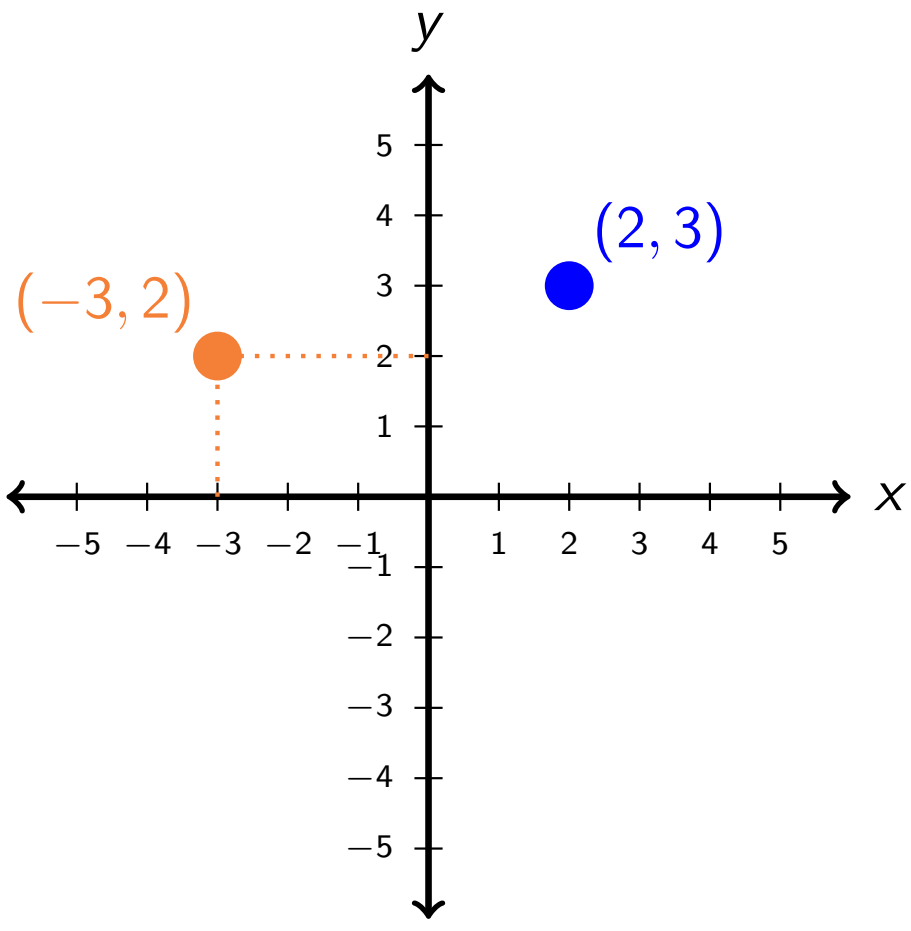

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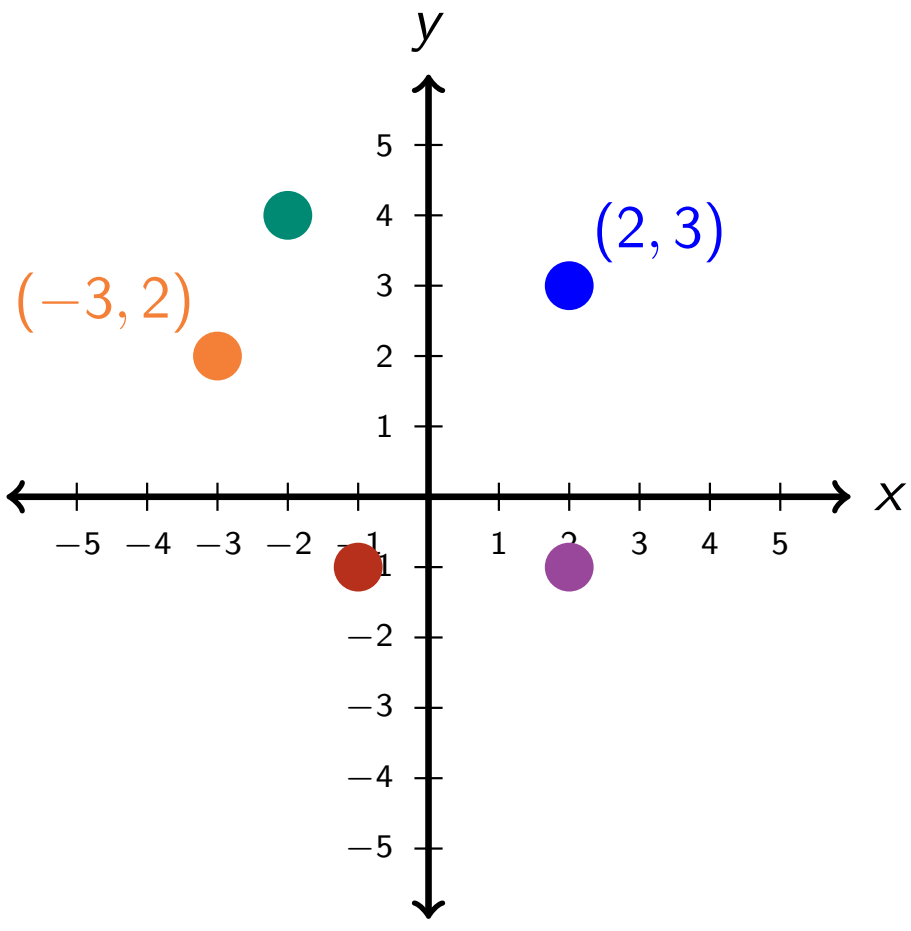

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The point (2,3) is 2 to the right and 3 above the origin.
What are the coordinates of the other points?

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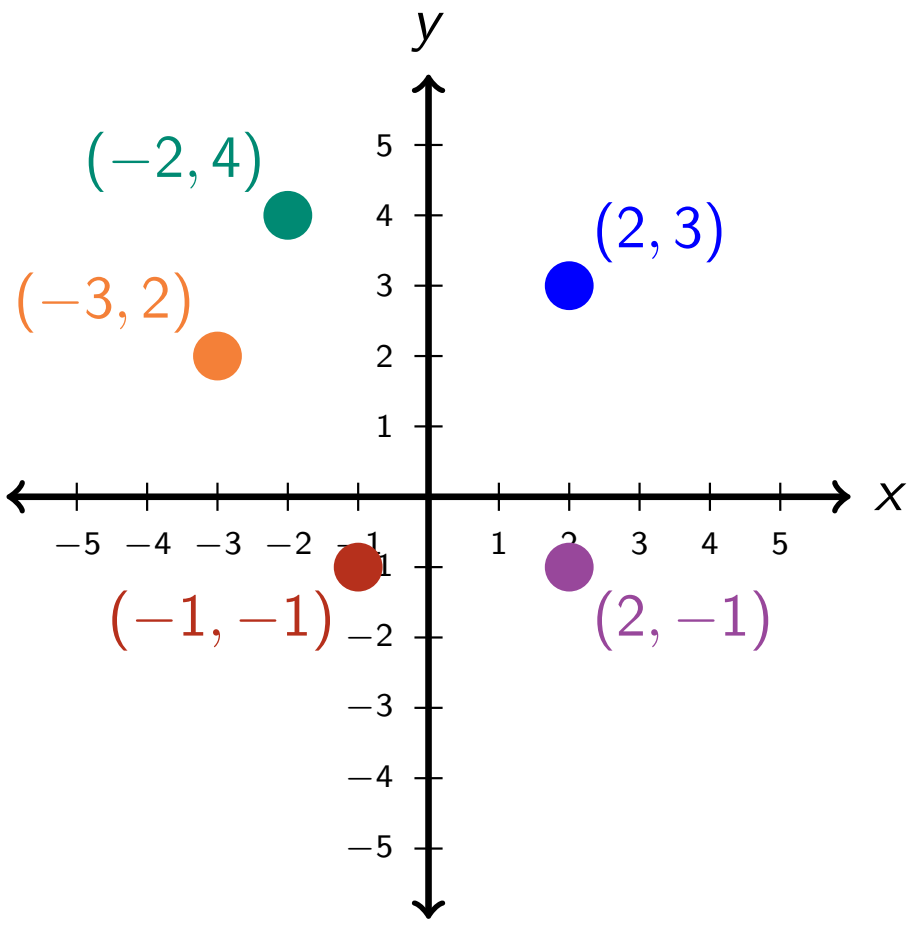

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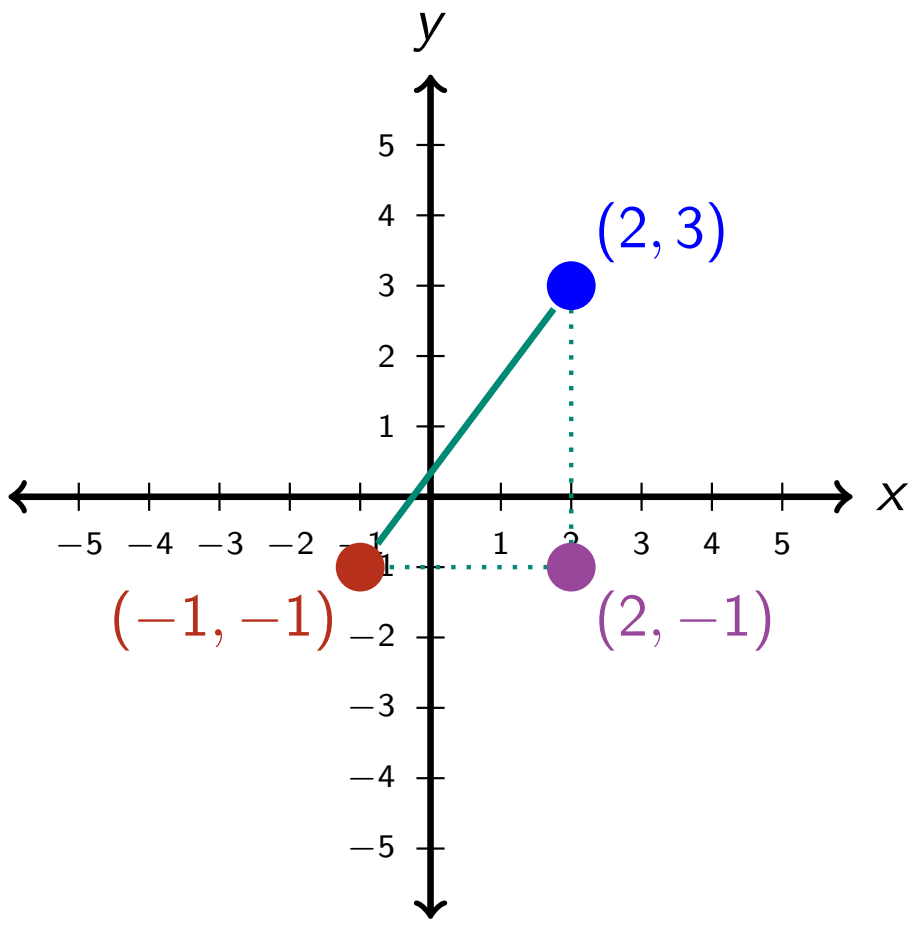
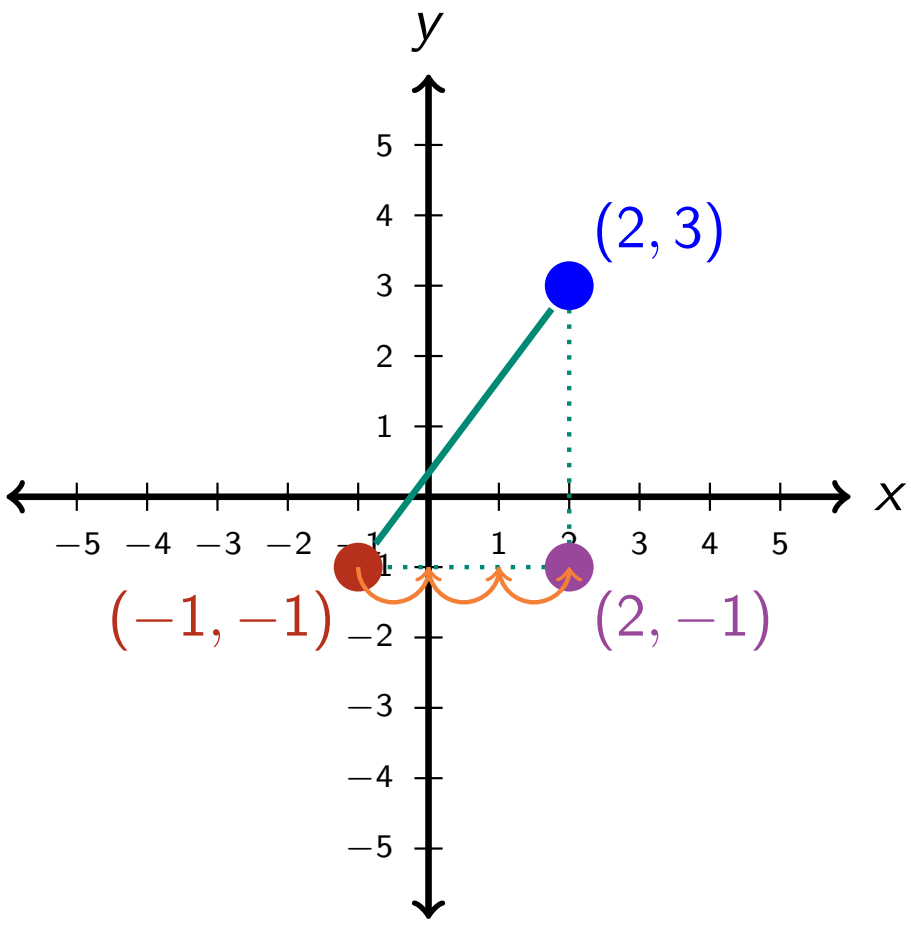


We can measure **distance** too.

Section 1.1: Graphs, Points, Distance



We can measure **distance** too.

From $(-1, -1)$ to $(2, -1)$ is a distance of **3**.

$3 = 2 - (-1)$

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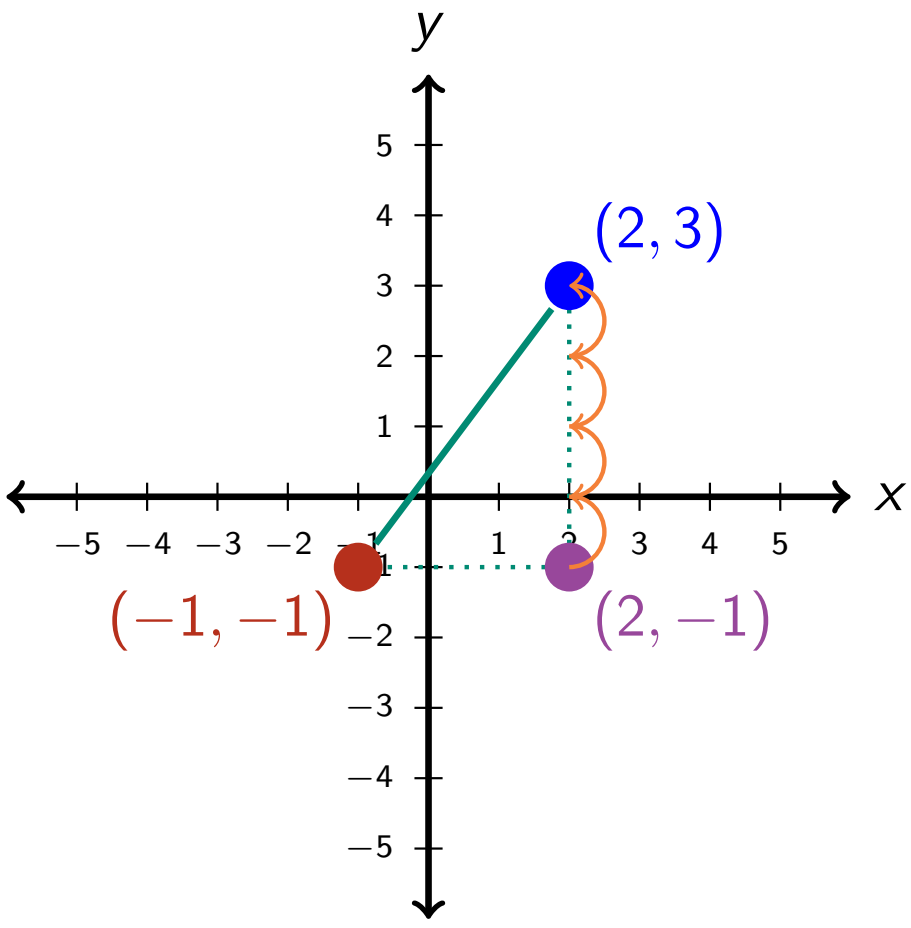

We can measure **distance** too.

From $(2, -1)$ to $(2, 3)$ is a distance of **4**.

$4 = 3 - (-1)$

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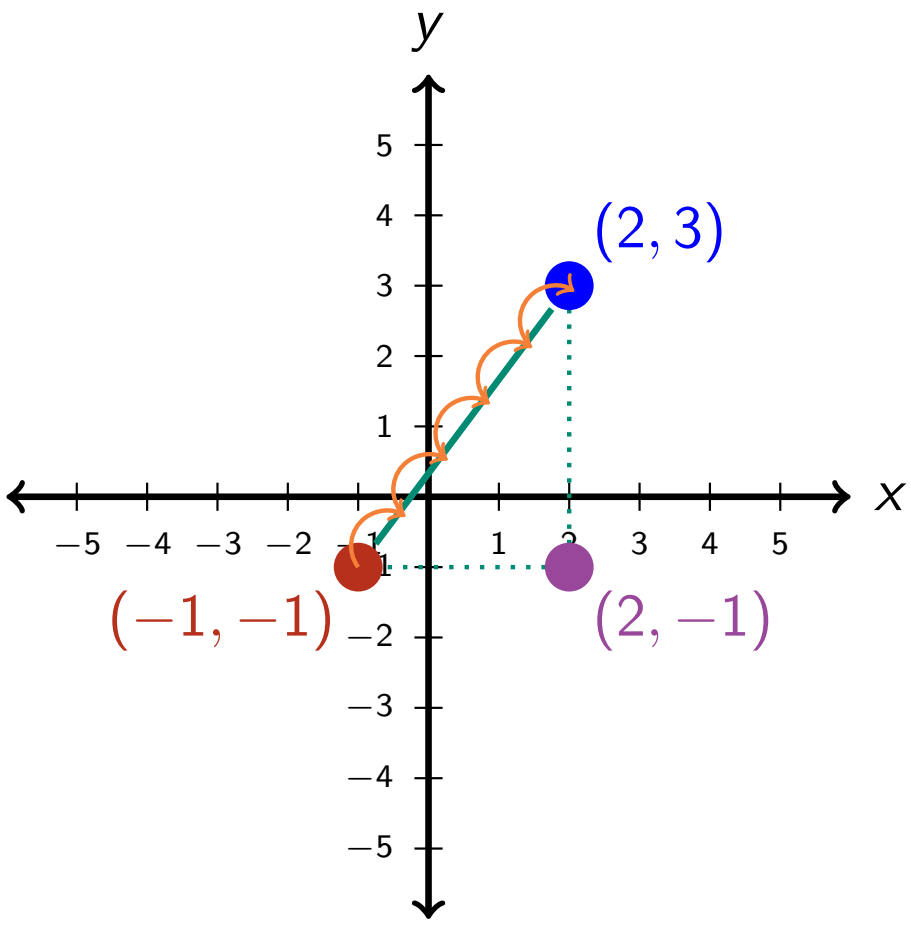

We can measure **distance** too.

From $(-1,-1)$ to $(2,3)$ is a distance of **5**.

$5 = \sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25}$

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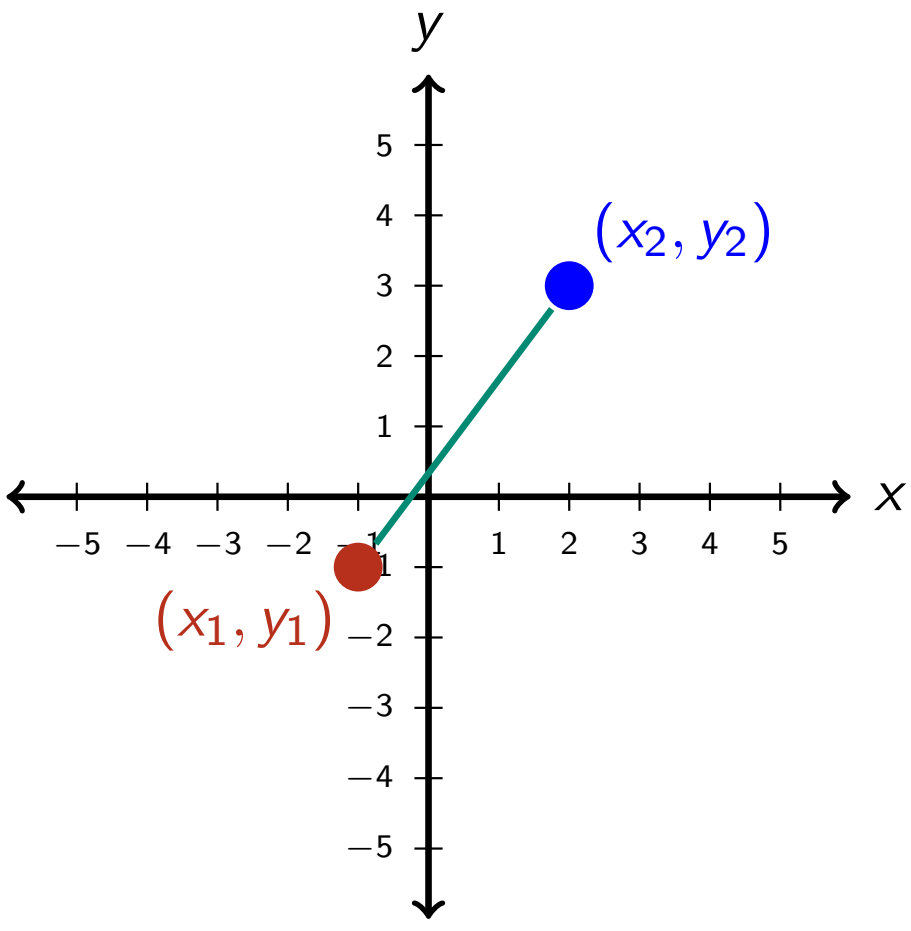


We can measure **distance** using the **distance formula**.

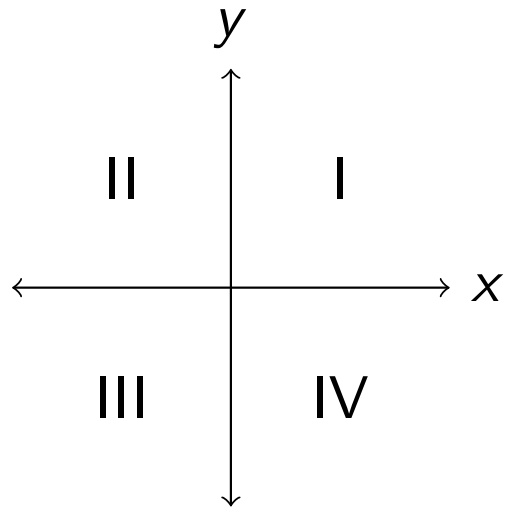
From (x_1, y_1) to (x_2, y_2) is a distance of **D**.

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

Section 1.1: Graphs, Points, Distance

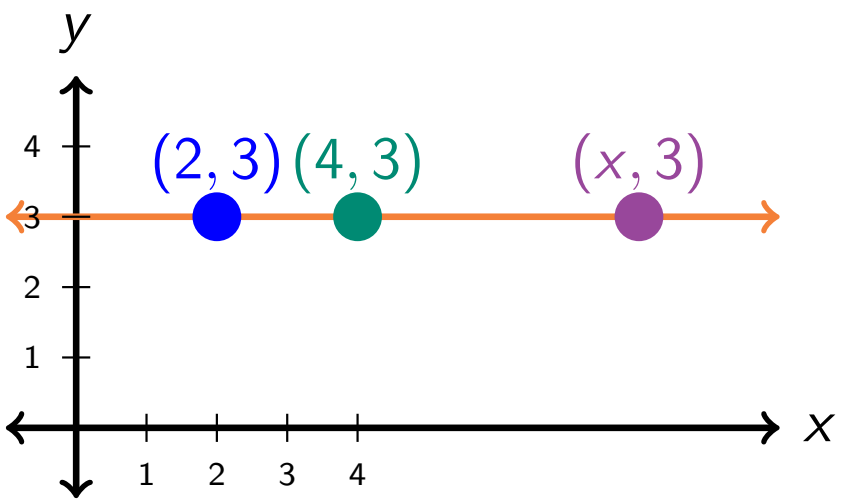
- Homework and exams will use the words:
  coordinates, **origin**, **quadrants**, **distance**
- You will be expected to use the **distance formula** to solve non-trivial problems
- Check your **textbook** for definitions and sample problems.

Quadrants:



Section 1.2: Equations of lines

- The coordinates (x, y) of points on a **line** satisfy some **equation**.
- For instance the **horizontal line** between the points $(2, 3)$ and $(4, 3)$ only has points of the form $(x, 3)$ on it.
- x can be anything, but y must be 3. **What is the equation?**



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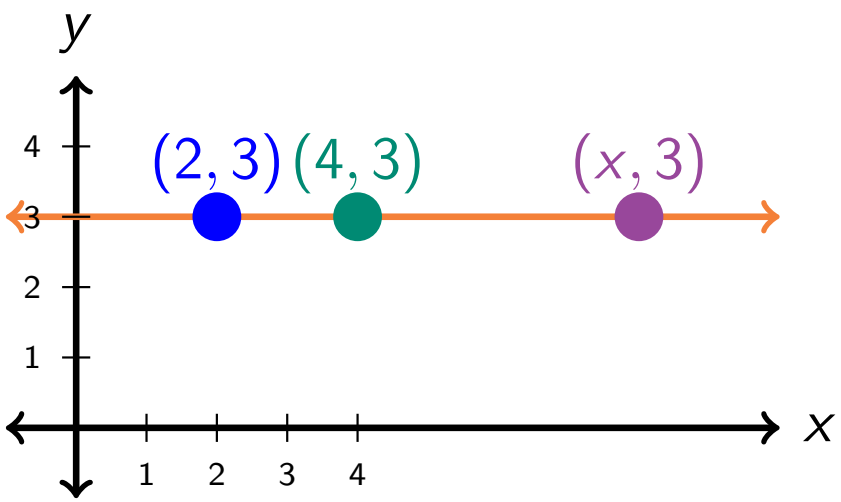
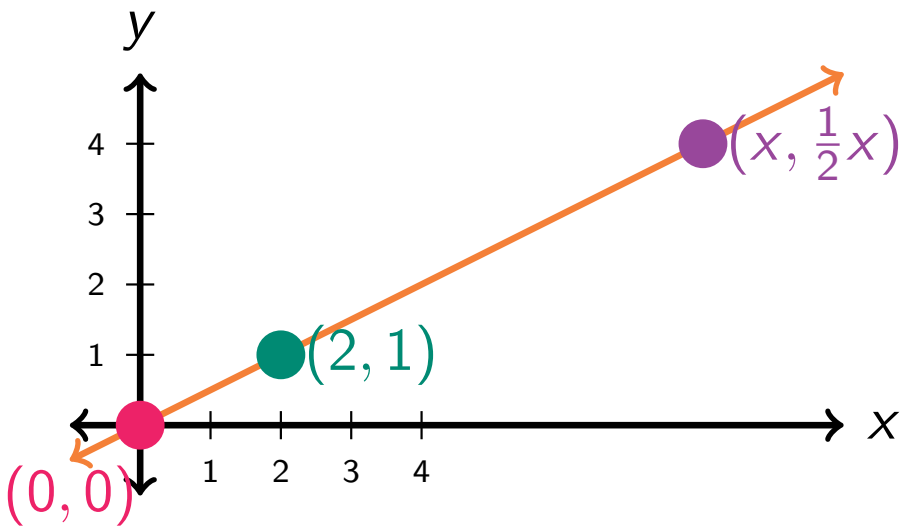
- For instance the **horizontal line** between the points $(2, 3)$ and $(4, 3)$ only has points of the form $(x, 3)$ on it.
- x can be anything, but y must be 3. The equation is **y=3**



Section 1.2: Equations of lines

- The diagonal line through the points $(0, 0)$ and $(2, 1)$ also goes through $(4, 2)$ and $(6, 3)$, indeed it only has points of the form $(x, \frac{1}{2}x)$ on it.
- Every time we go right by 2, we only go up by 1.
- y is always half as big as x. **What is the equation of the line?**



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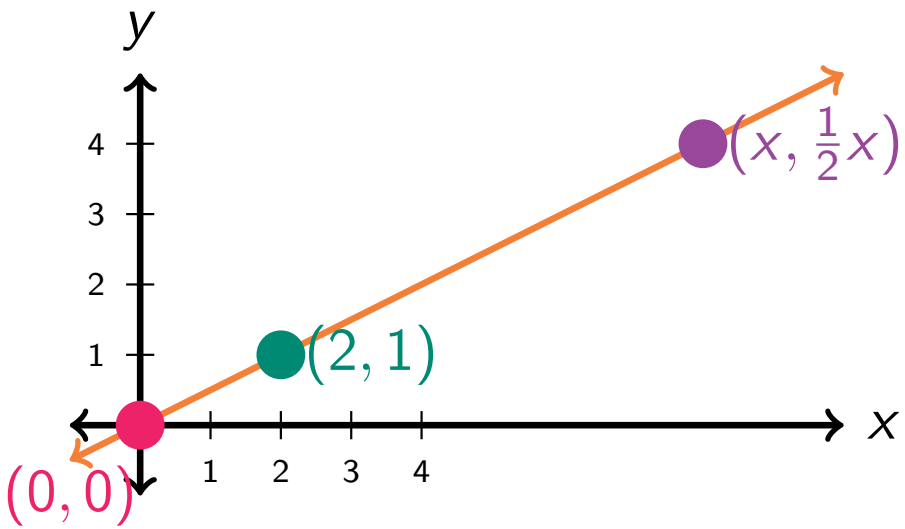
- Every time we go right by 2, we only go up by 1.

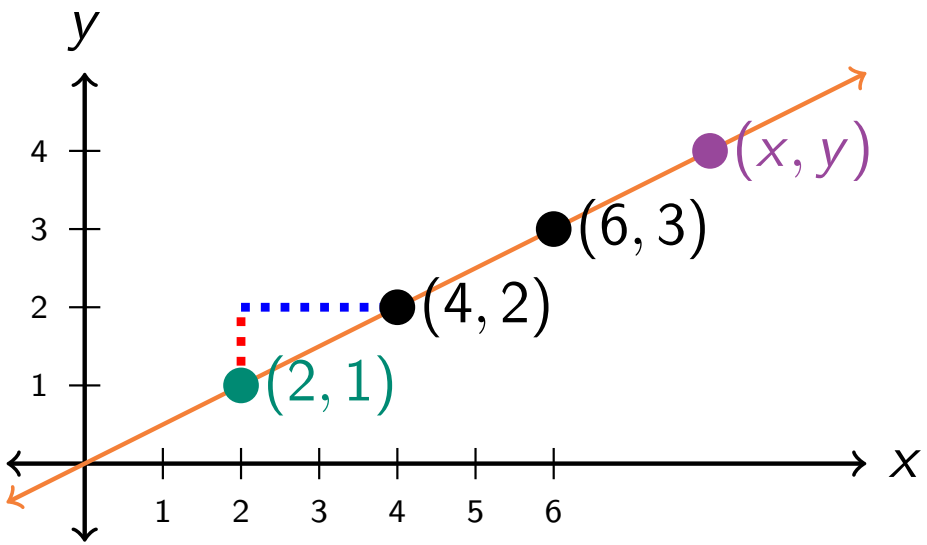
- y is always half as big as x. The equation is $\mathbf{y = \frac{1}{2}x}$.



Section 1.2: Slope of a line

- The ratio of how far we **go up** as we **go right** is called **slope**.
- Here we **go up** by $1 = 2\text{-}1$ and we **go right** by $2 = 4\text{-}2$, so the slope is

$$m = \frac{1}{2}$$



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- Here we **go up** by $1 = 3\text{-}2$ and we **go right** by $2 = 6\text{-}4$, so the slope is **still**

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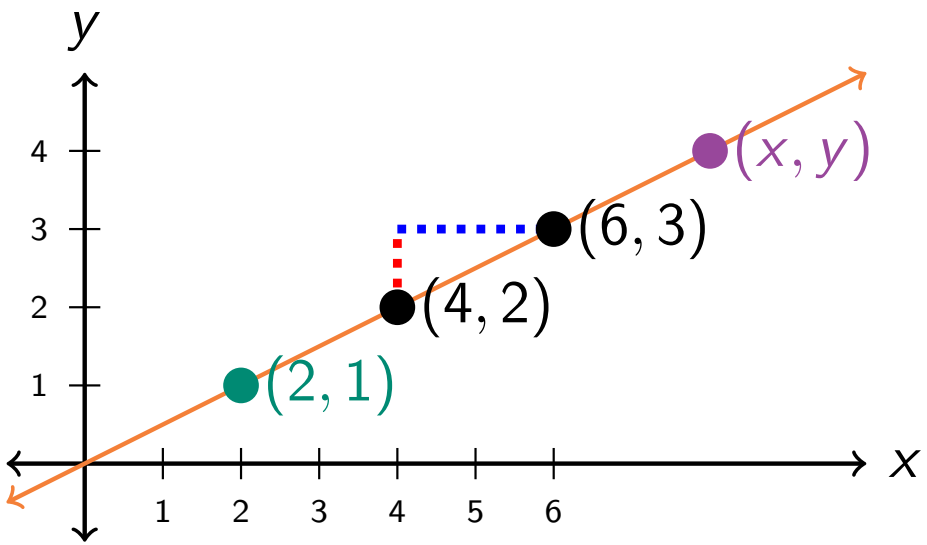

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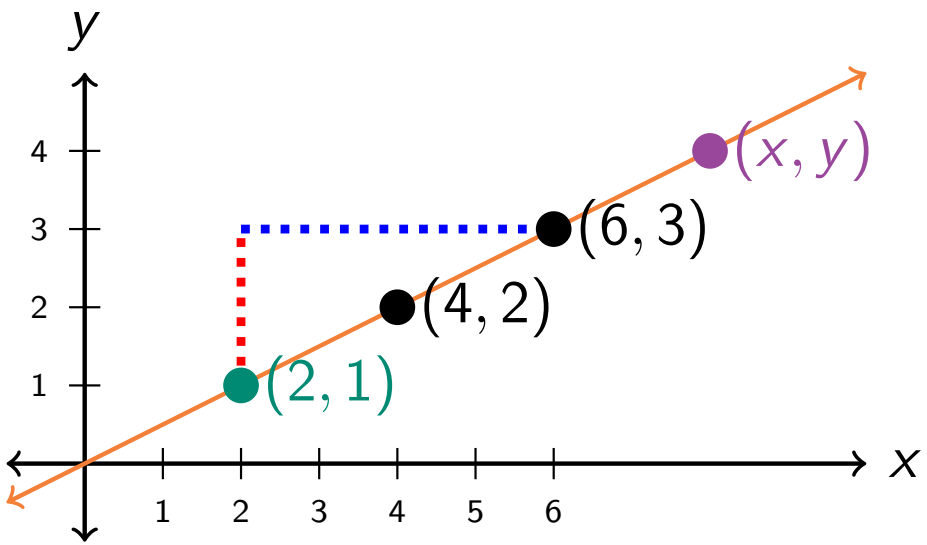
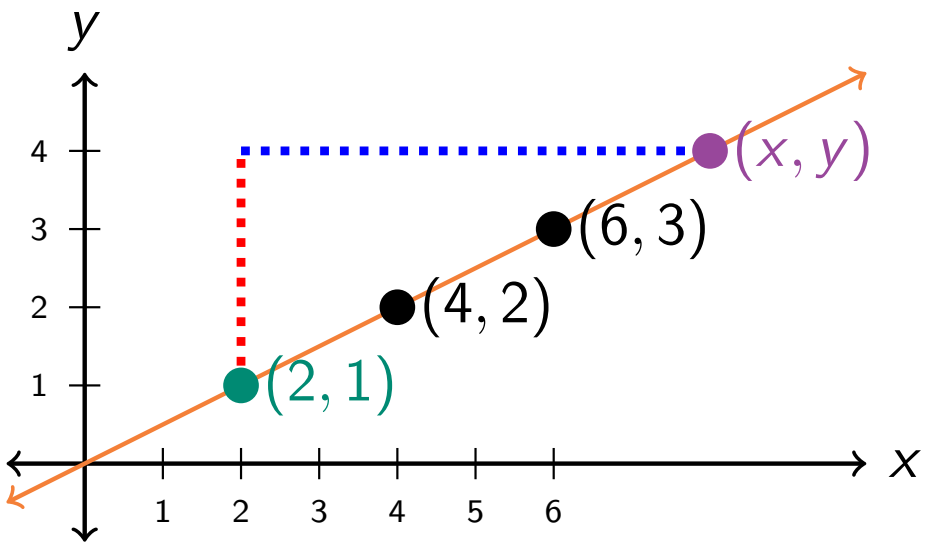
$$m = \frac{2}{4} = \frac{1}{2}$$



Section 1.2: Slope of a line

- The ratio of how far we **go up** as we **go right** is called **slope**.
- Here we **go up** by $y - 1$ and we **go right** by $x - 2$, so the slope is **still**

$$\frac{1}{2} = m = \frac{y-1}{x-2}$$



Section 1.2: Point slope form

- The equation from the last slide:

$$m = \frac{y-1}{x-2} = \frac{1}{2}$$

- Can be solved for y to give us the **point-slope** form of the line:

$$y - 1 = \frac{1}{2} \cdot (x - 2)$$

$$y = \frac{1}{2} \cdot (x - 2) + 1$$

- This can also be put into the **slope-intercept** form we started with:

$$y = \frac{1}{2}x - \frac{1}{2}2 + 1 = \frac{1}{2}x - 1 + 1 = \frac{1}{2}x$$

Section 1.2: Equations of lines

- Exams and homework will use the words:
  slope, **y-intercept**, **x-intercept**, **perpendicular**, **parallel**
- You will be expected to use the slope of perpendicular lines to solve non-trivial problems.
- If the slope of a line is m, then the slope of the **perpendicular line** is?
- For exam 2, you will be expected to graph many lines, and find the equations of many graphed lines.

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- If the slope of a line is m, then the slope of the **perpendicular line** is $-1/m$.

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