MA162: Finite mathematics

Jack Schmidt

University of Kentucky

August 24, 2011

Schedule:

- HW 0.1 is due Friday, Aug 26th, 2011.
- HW 0.2 is due Tuesday, Aug 30th, 2011.
- HW 1.1-1.4 are due Friday, Sep 2nd, 2011.
- Exam 1 is Monday, Sep 26th, 5:00pm-7:00pm in CB106.

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

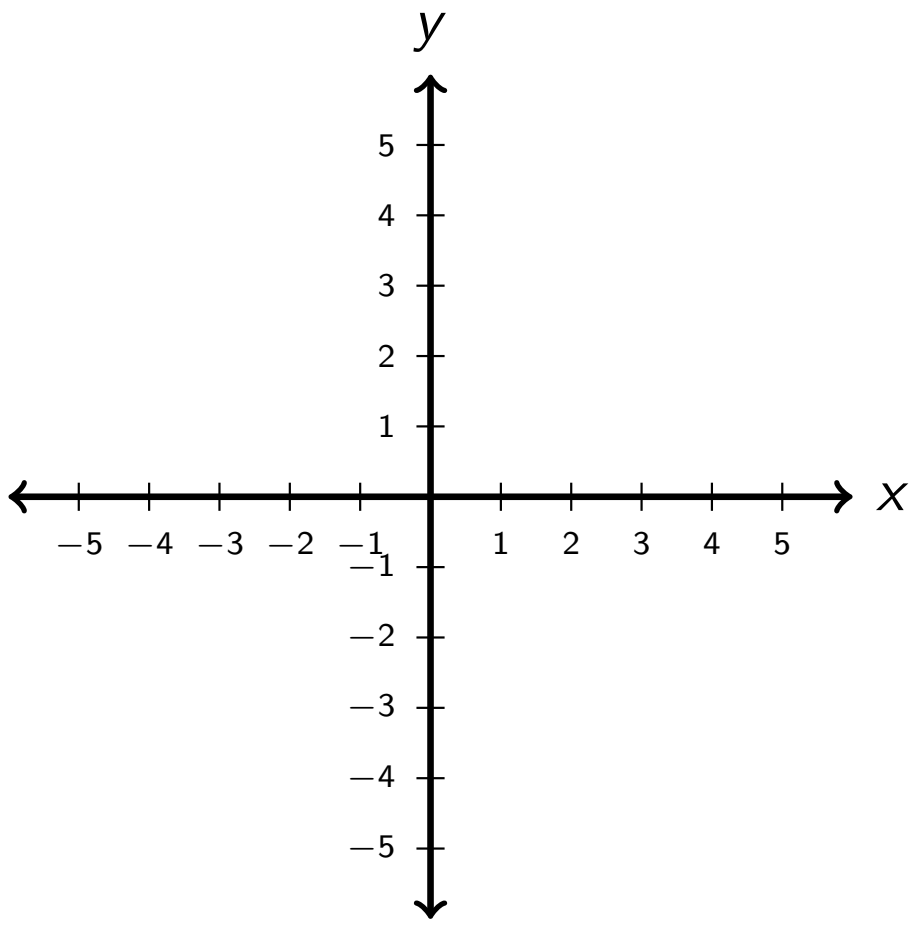
Expectations

- 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 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

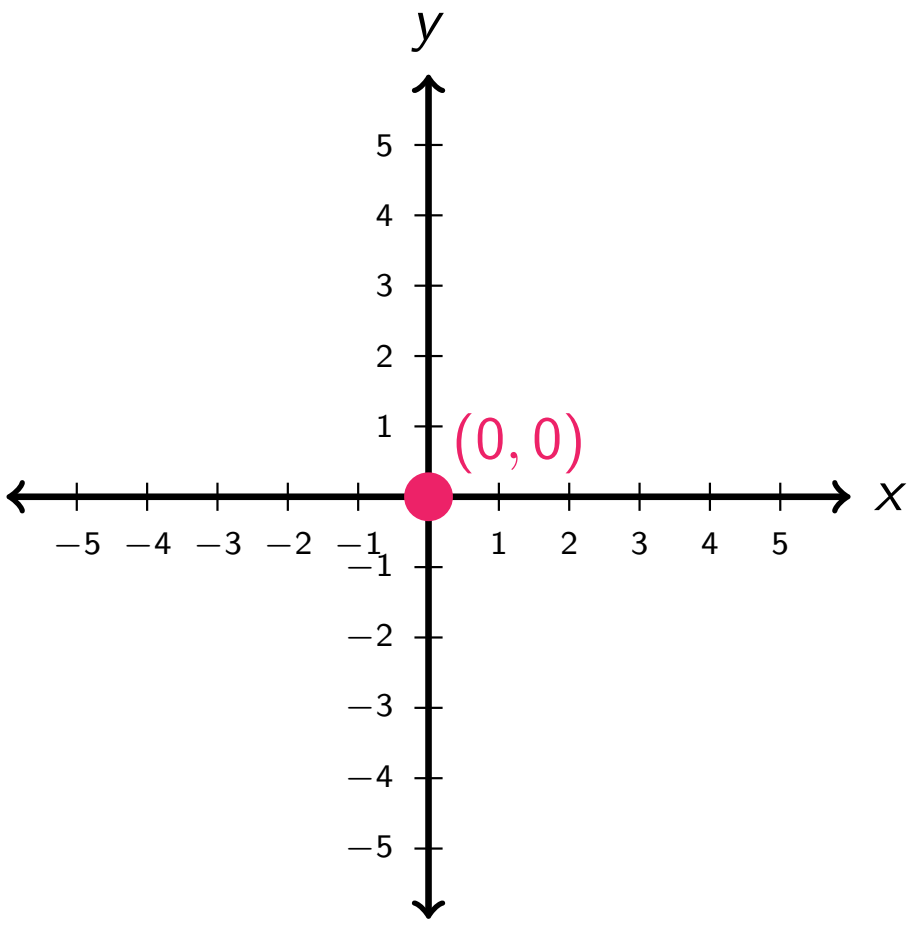
- Our time is valuable; clear policies and procedures avoid waste
- The **syllabus** describes the policies and procedures of this course.
- Make sure you are comfortable with the **absence policy**, the **grading policy**, and the **exam dates**.
- Make sure you are committed to handling the **time 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



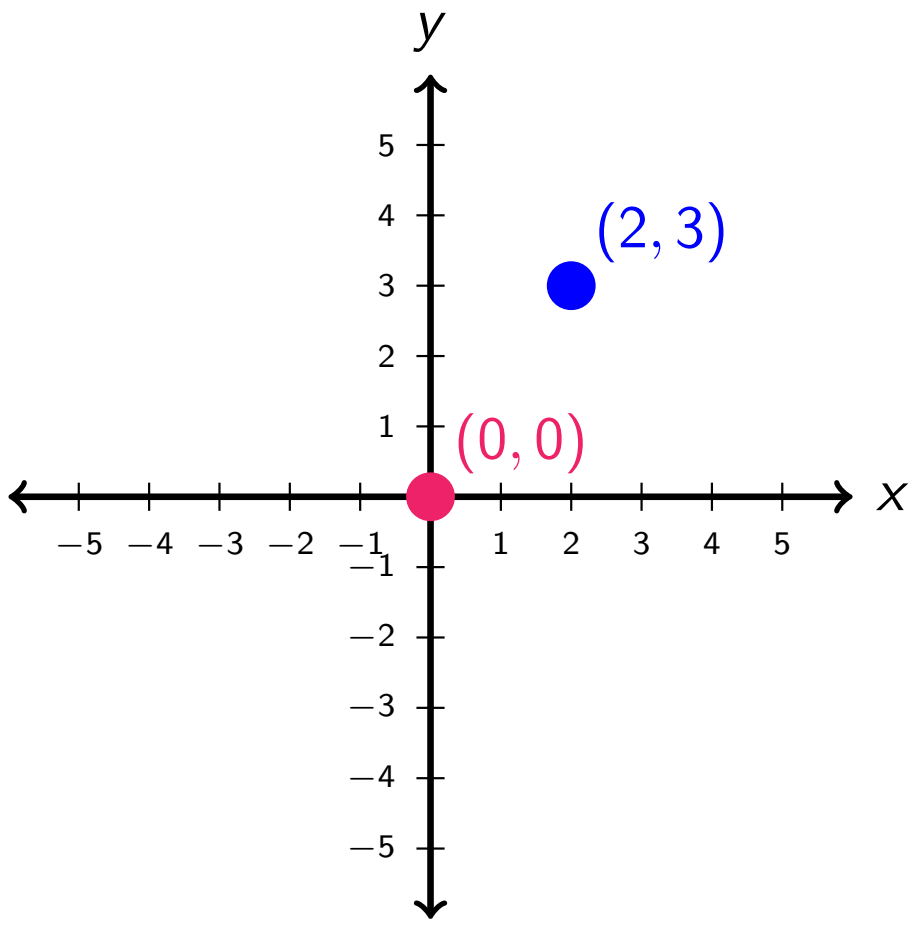
We can locate points using two numbers: **coordinates**.

Section 1.1: Graphs, Points, Distance



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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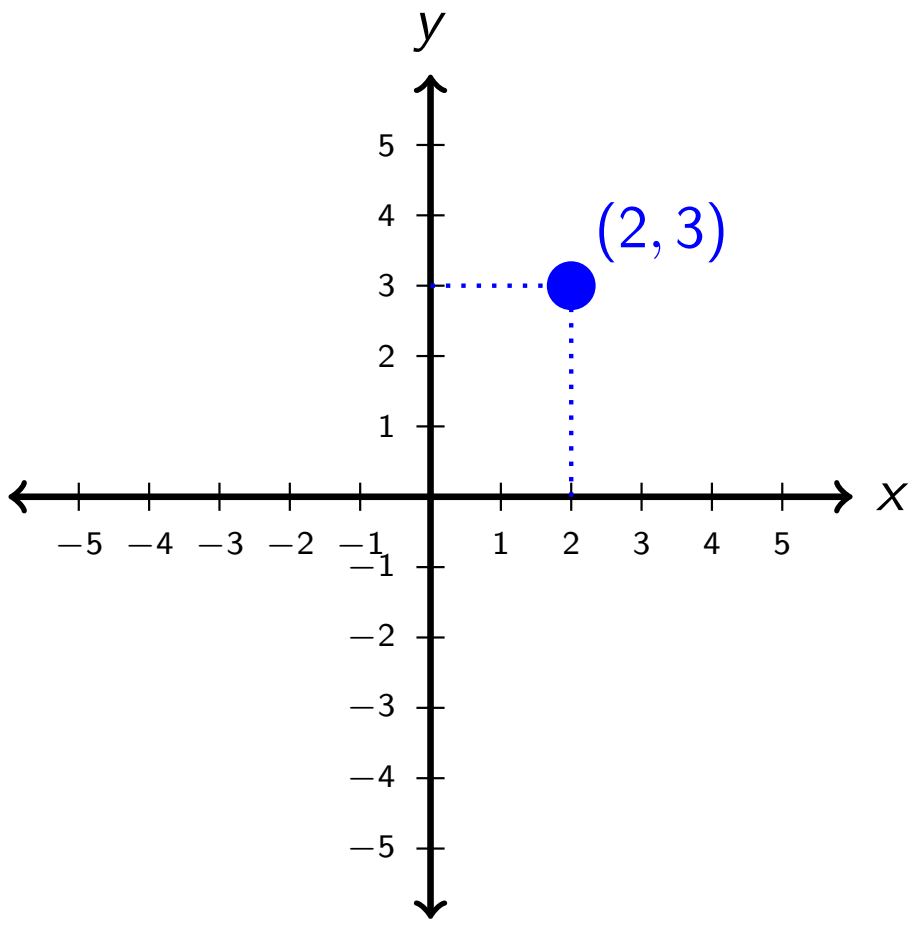

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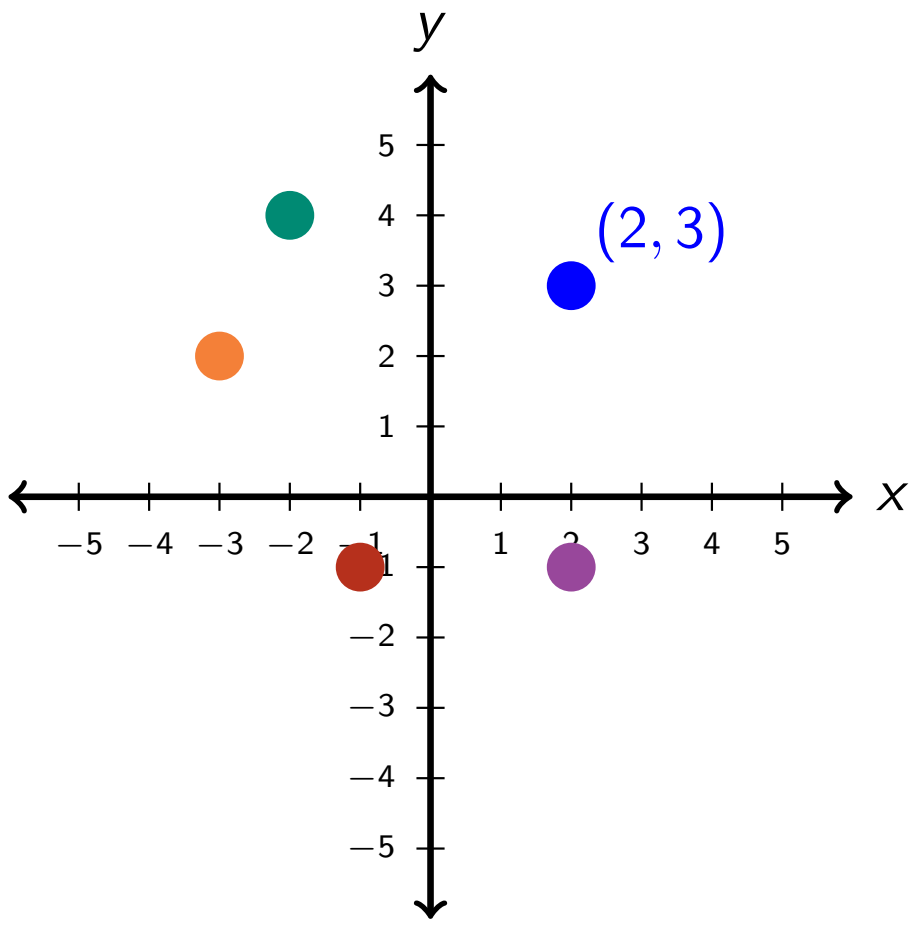

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The point (2,3) is 2 to the right and 3 above the origin.
Which color is (-3,2)?

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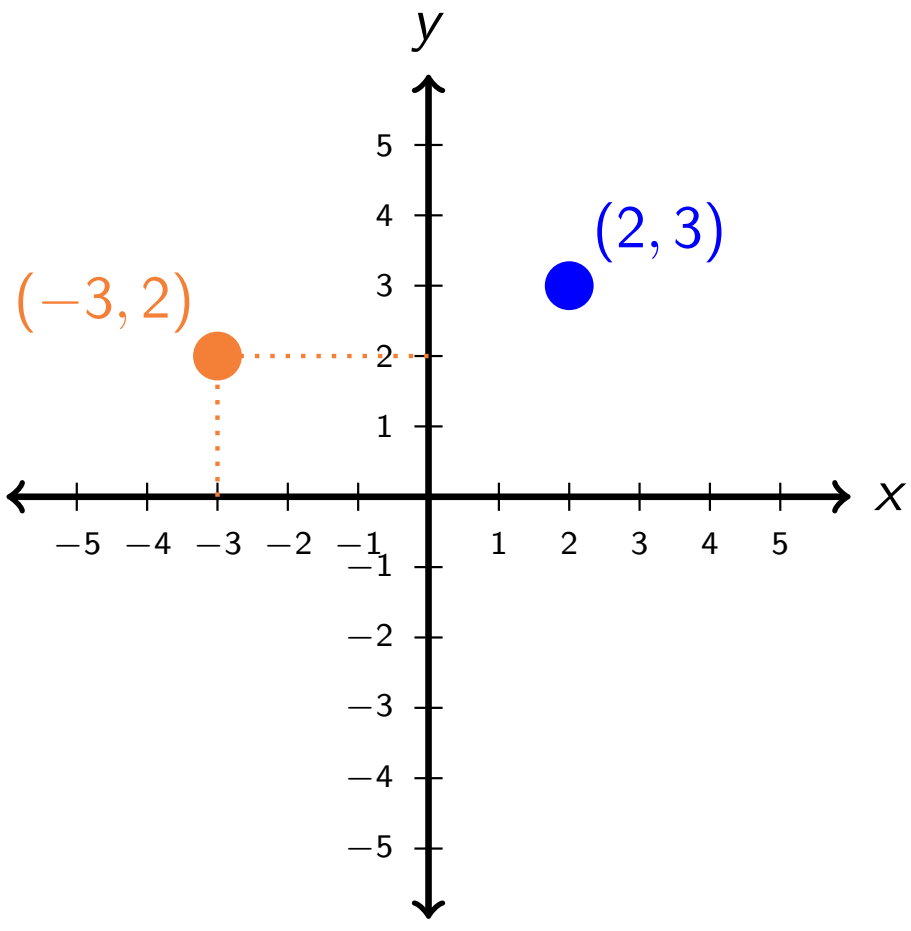

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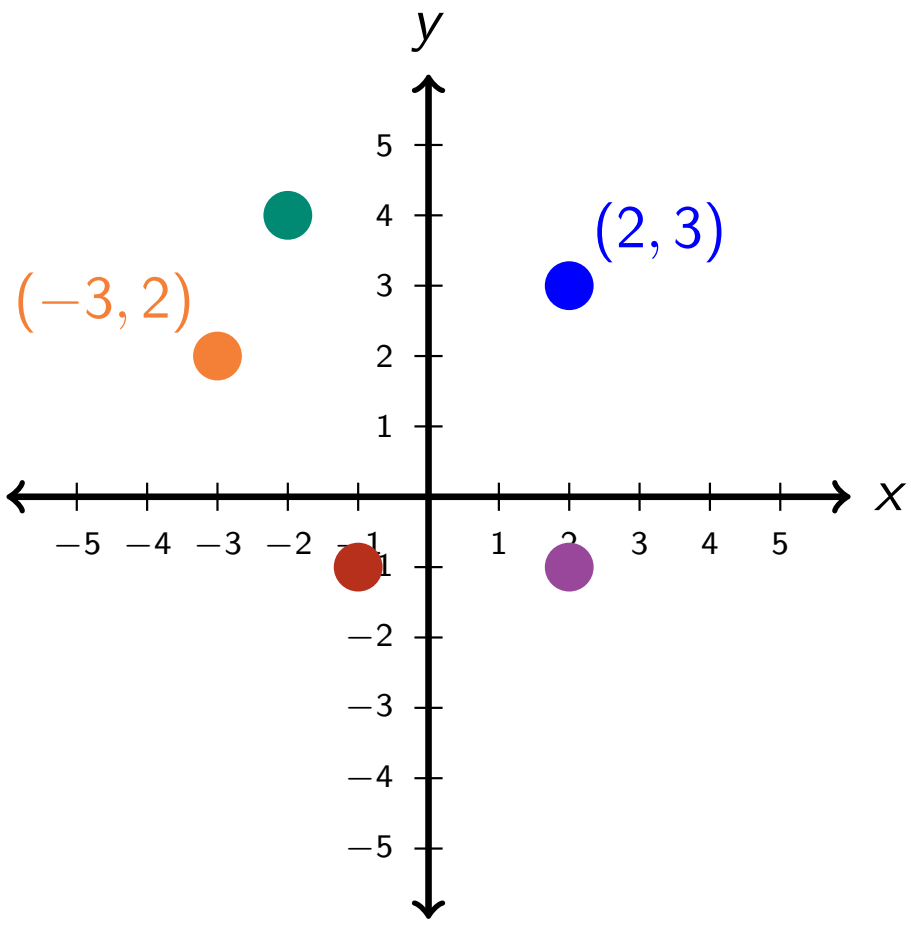

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The point (2,3) is 2 to the right and 3 above the origin.
What are the coordinates of the other points?

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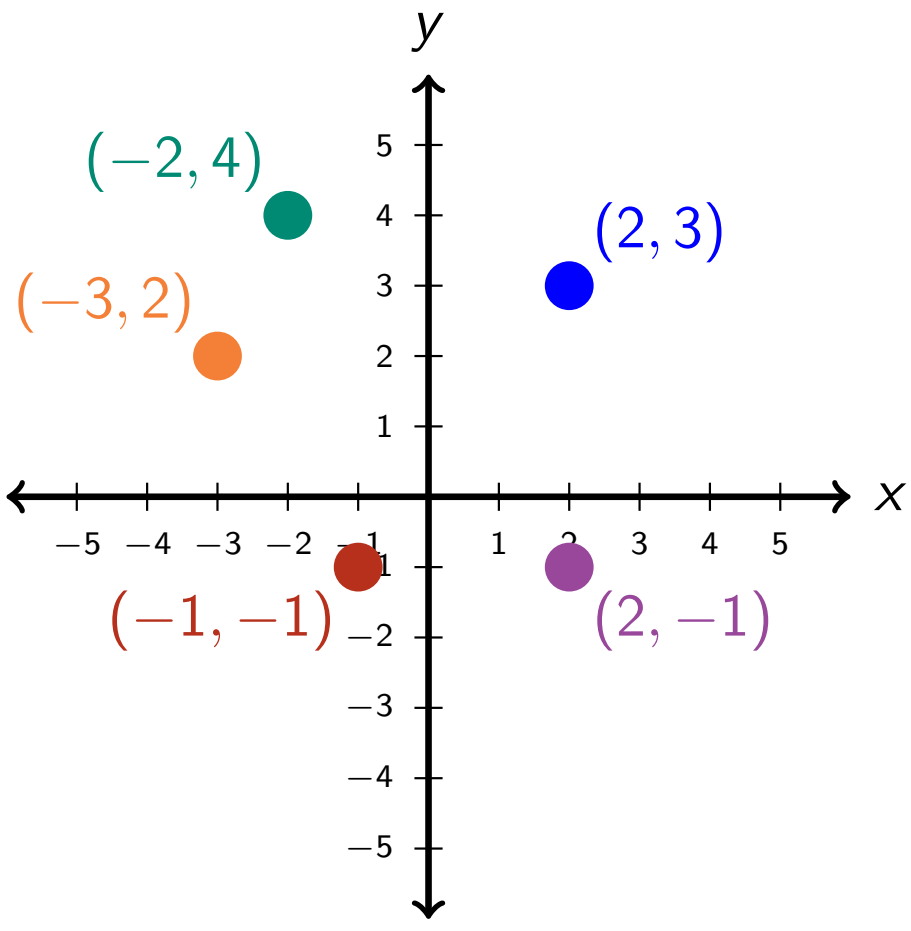

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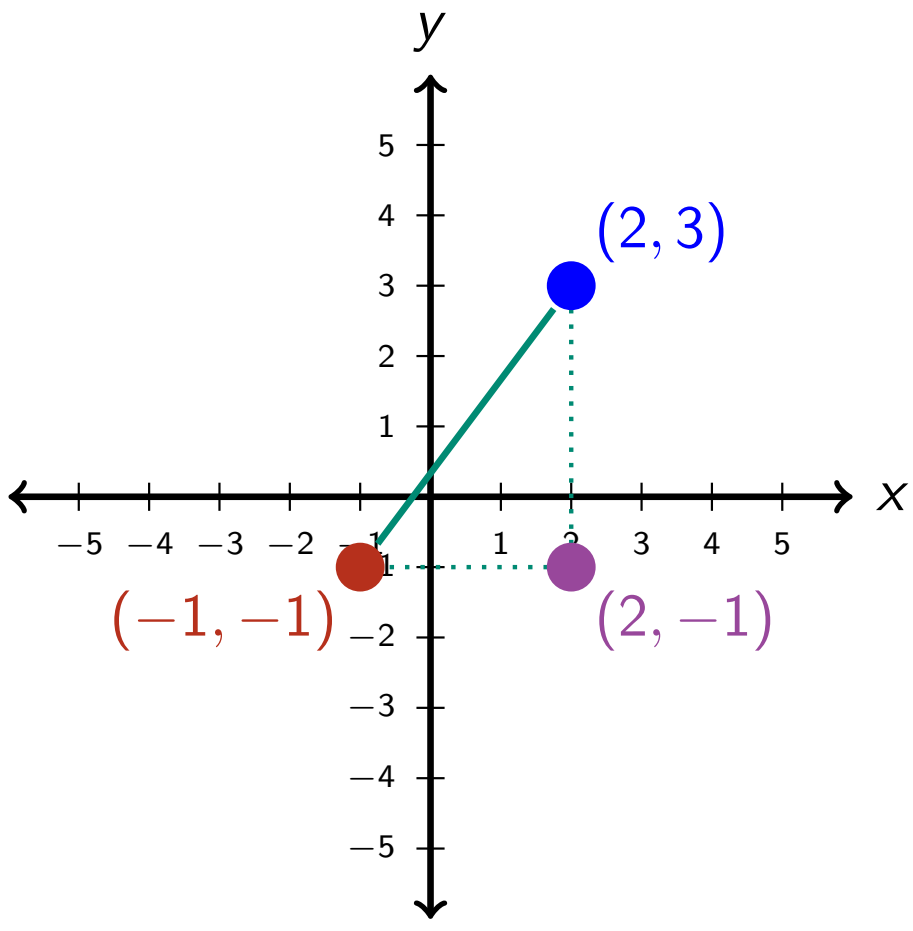
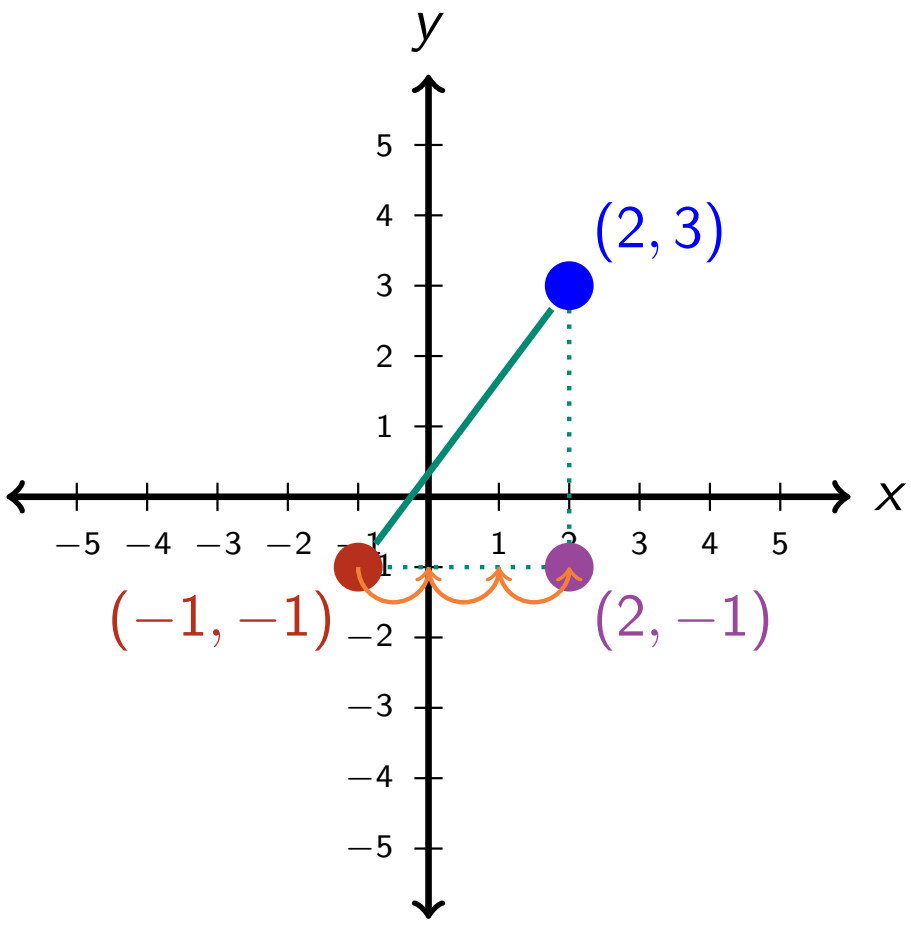


We can measure **distance** too.

Section 1.1: Graphs, Points, Distance

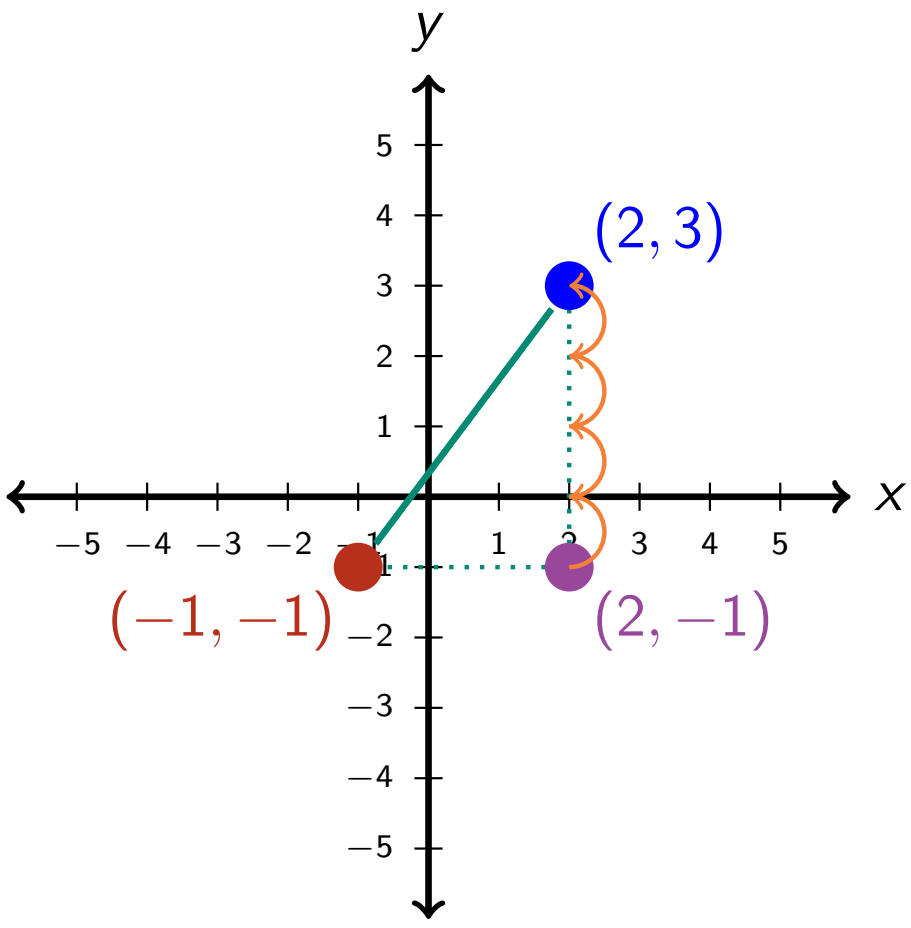


We can measure **distance** too.

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

$3 = 2 - (-1)$

Section 1.1: Graphs, Points, Distance



We can measure **distance** too.

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

$4 = 3 - (-1)$

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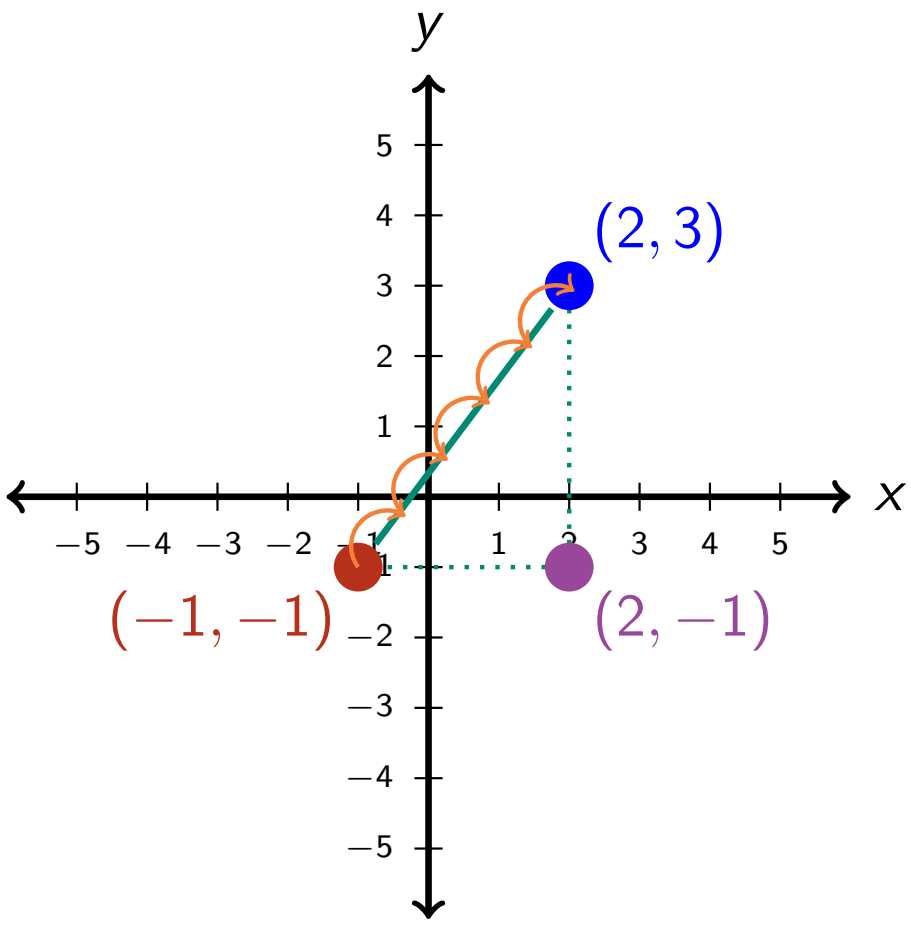
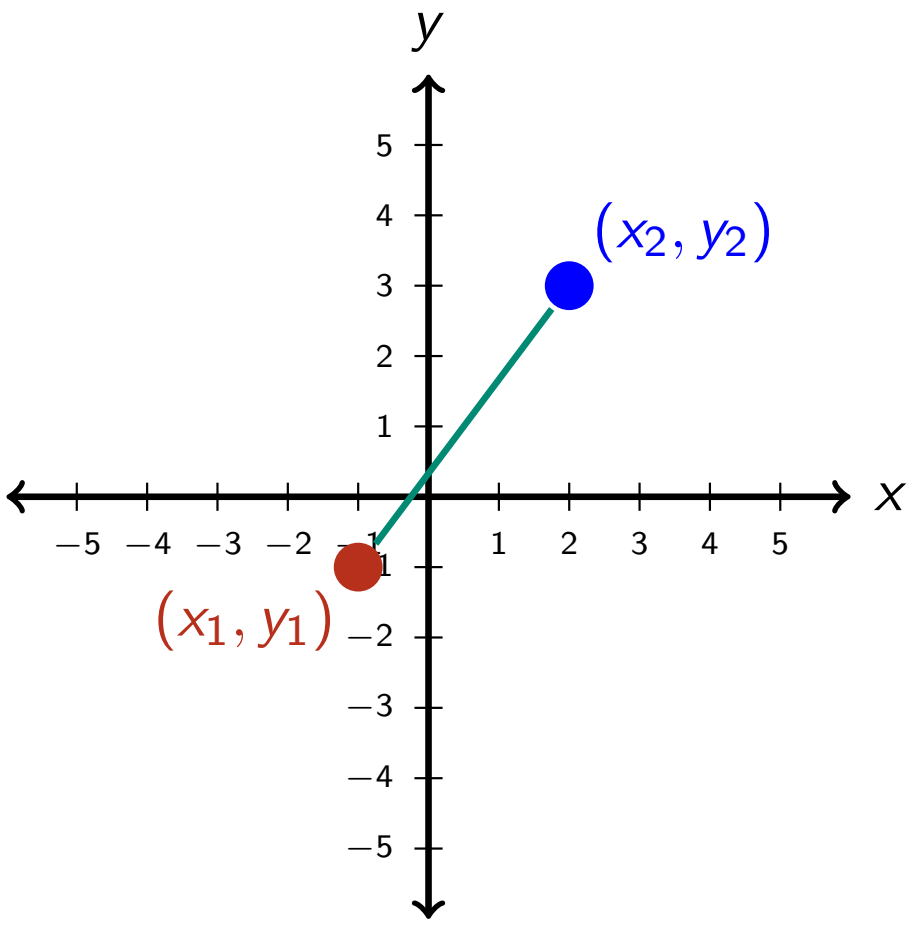


We can measure **distance** too.

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

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

Section 1.1: Graphs, Points, Distance



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

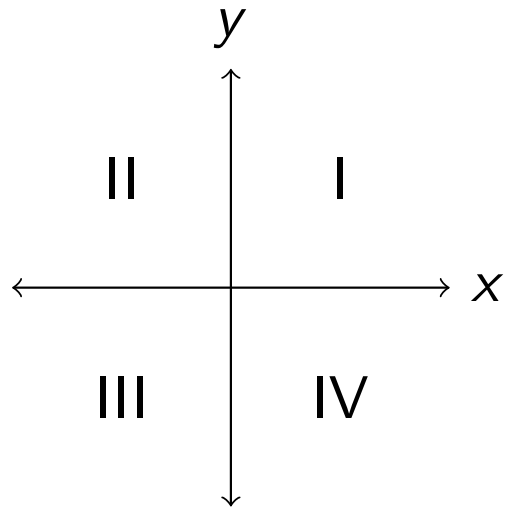
From (x_1, y_1) to (x_2, y_2) is a distance of **D**.

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

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 1.1: Did we understand it?

- Math is easy to listen to. I expect you to talk math too.

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- Math is easy to listen to. I expect you to talk math too.
- Which is further away from $(0, 0)$?

(Left) for $(3, 3)$ which is 3 over and 3 up

(Right) for $(2, 4)$ which is 2 over and 4 up

(Both) hands if the same distance

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- Now talk to your neighbor and convince them you are right. This is especially good if you disagree at first, but even if you agree, make sure you are both right...

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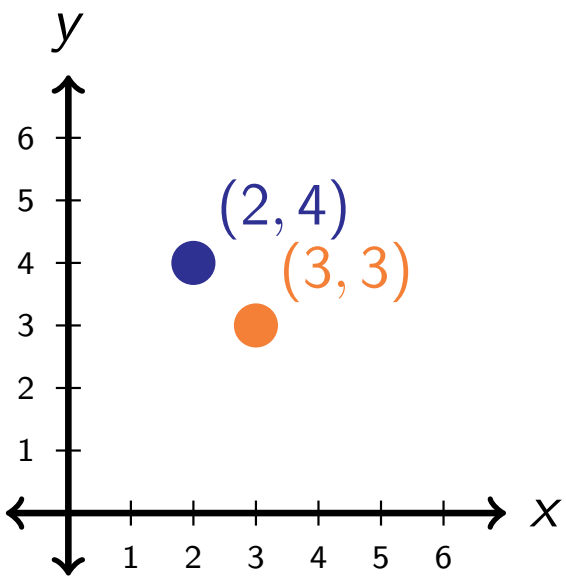
- Now talk to your neighbor and convince them you are right. This is especially good if you disagree at first, but even if you agree, make sure you are both right...
- Now explain it to us, especially someone who changed their mind.

Section 1.1: Do we understand now?

- From the picture we see they are pretty close, 4.2 versus 4.5



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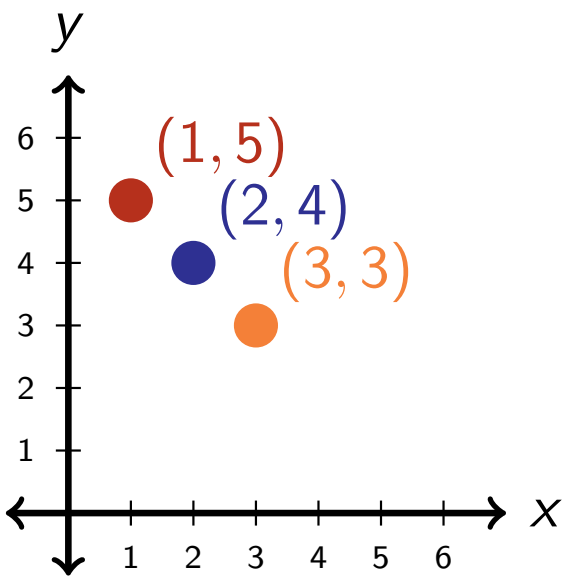

- Which is further away from $(0, 0)$?

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(Right) for $(1, 5)$ which is 1 over and 5 up

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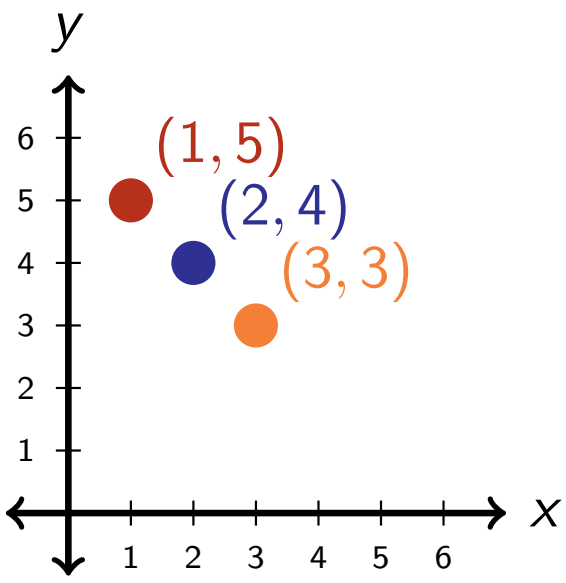

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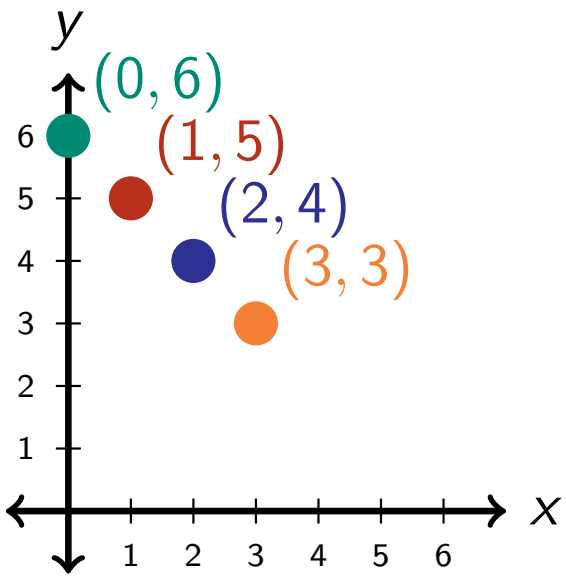

- Which is further away from $(0, 0)$?

(Left) for $(3, 3)$ which is 3 over and 3 up

(Right) for $(0, 6)$ which is just 6 up

(Both) hands if the same distance

Section 1.1: A few more questions

- Which is further away from $(0, 0)$?

  (L) for $(-2, 4)$ which is 2 left and 4 up

  (R) for $(2, 4)$ which is 2 right and 4 up

  (B) hands if the same distance

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- Which is further away from $(0, 0)$?

  (L) for $(-2, 4)$ which is 2 left and 4 up

  (R) for $(2, 4)$ which is 2 right and 4 up

  (B) hands if the same distance

- Which points are in the same quadrant as $(-4, 6)$?

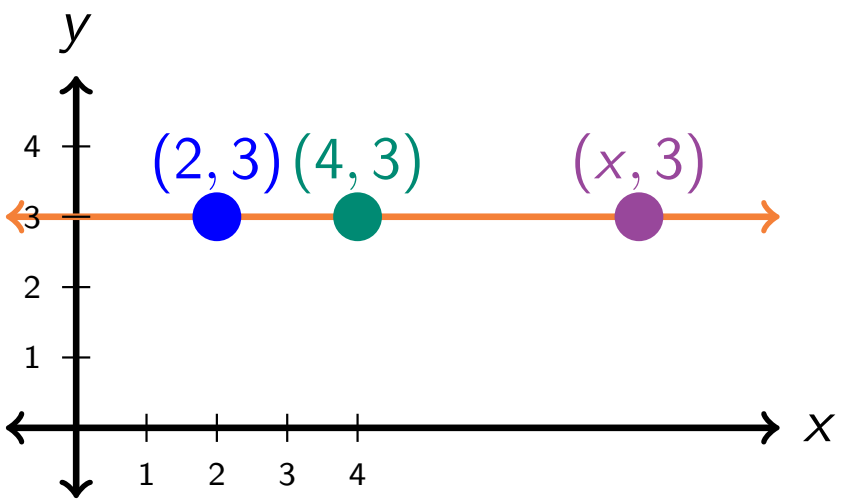
  (L) for $(10, -3)$

  (R) for $(-3, 10)$

  (B) if everybody is in the same quadrant

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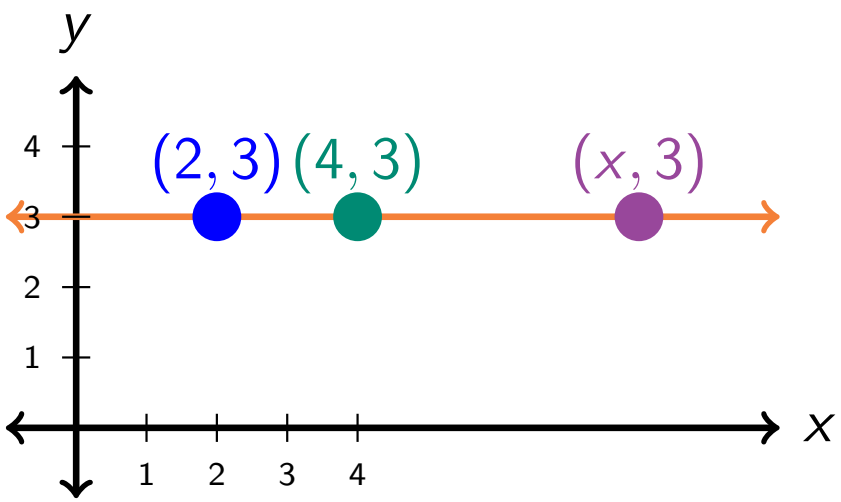
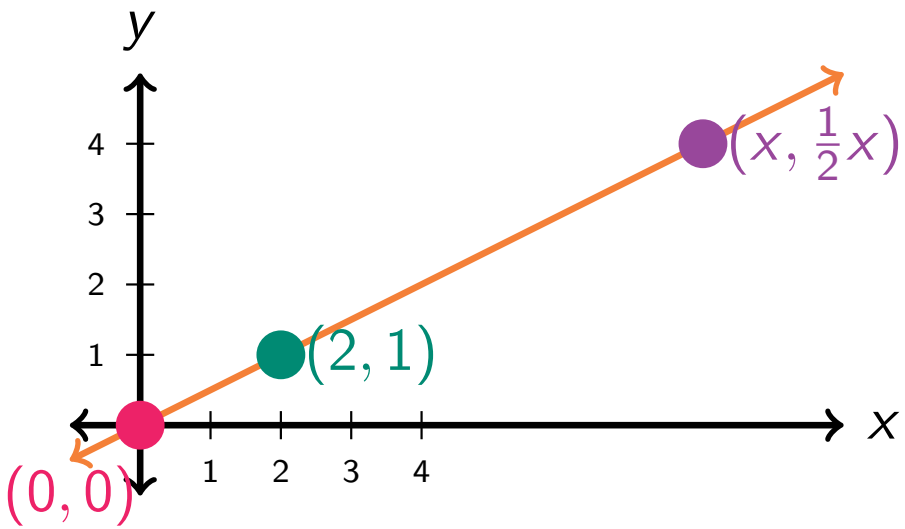
- For instance the **horizontal line** between the points $(2, 3)$ and $(4, 3)$ only has points of the form $(x, 3)$ on it.
- x can be anything, but y must be 3. The equation is **y=3**



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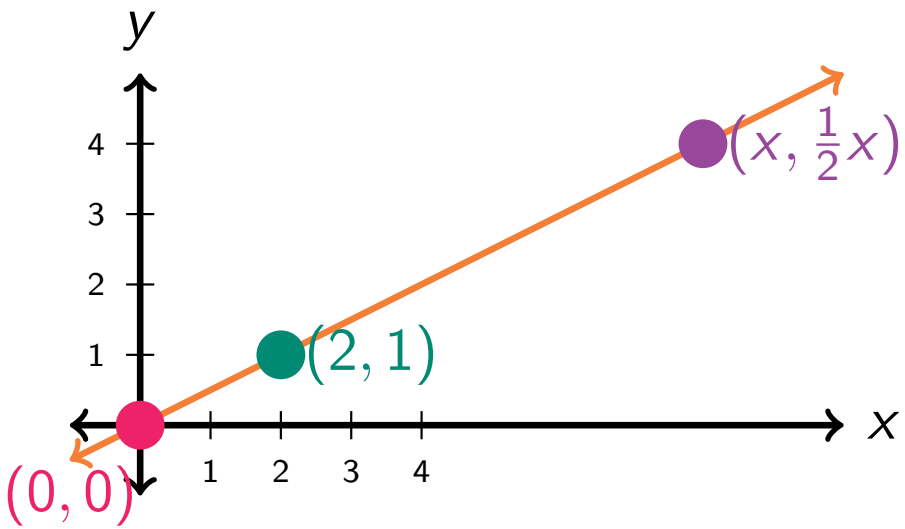
- Every time we go right by 2, we only go up by 1.

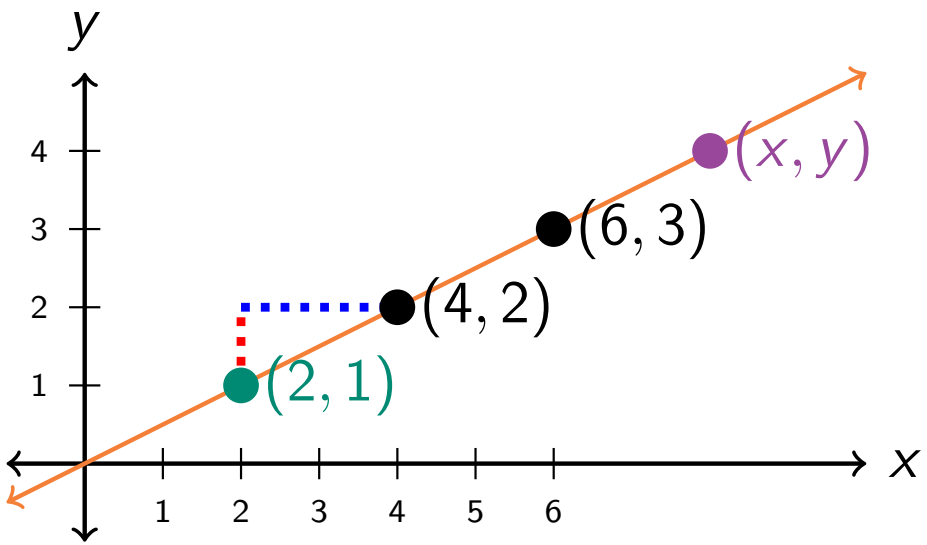
- y is always half as big as x. The equation is $\mathbf{y = \frac{1}{2}x}$.



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 $1 = 2 - 1$ and we **go right** by $2 = 4 - 2$, so the slope is

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



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

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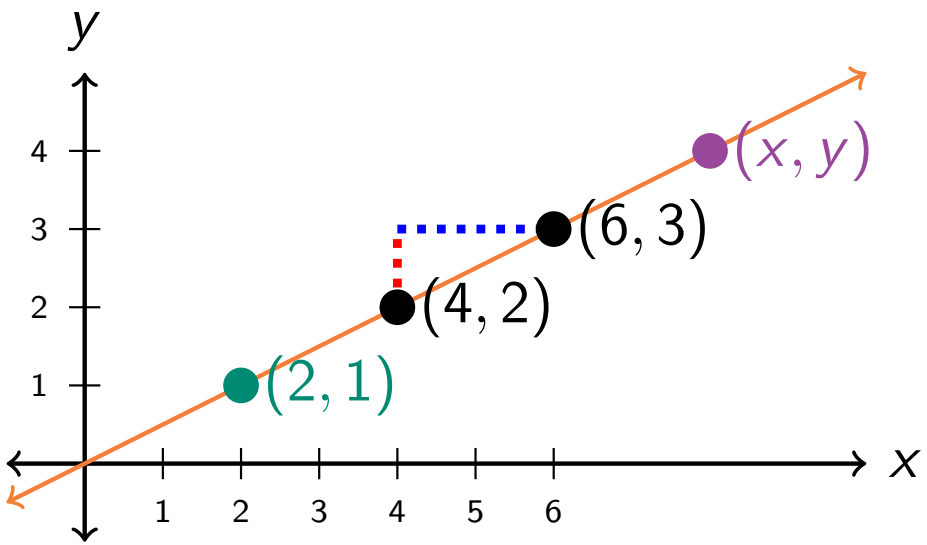

Section 1.2: Slope of a line

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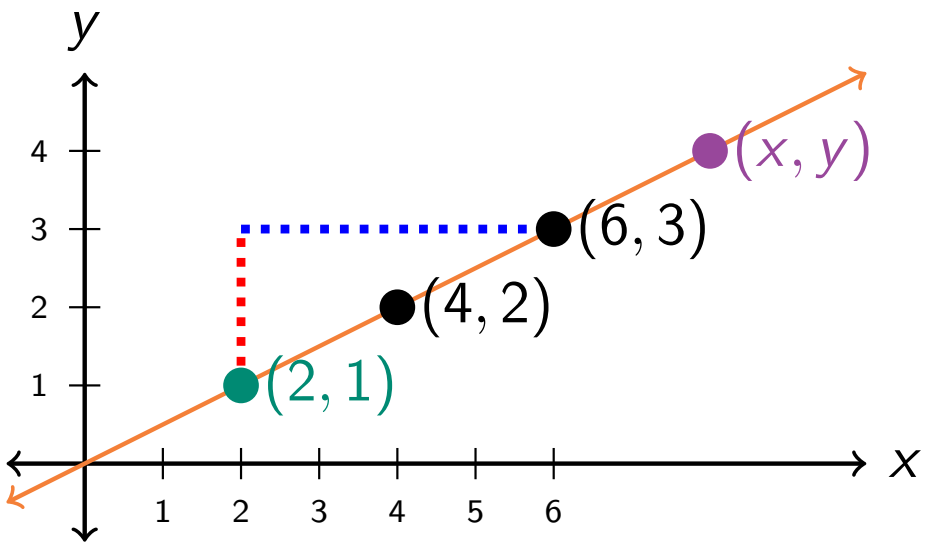
- Here we **go up** by $2 = 3 - 1$ and we **go right** by $4 = 6 - 2$, so the slope is **still**

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



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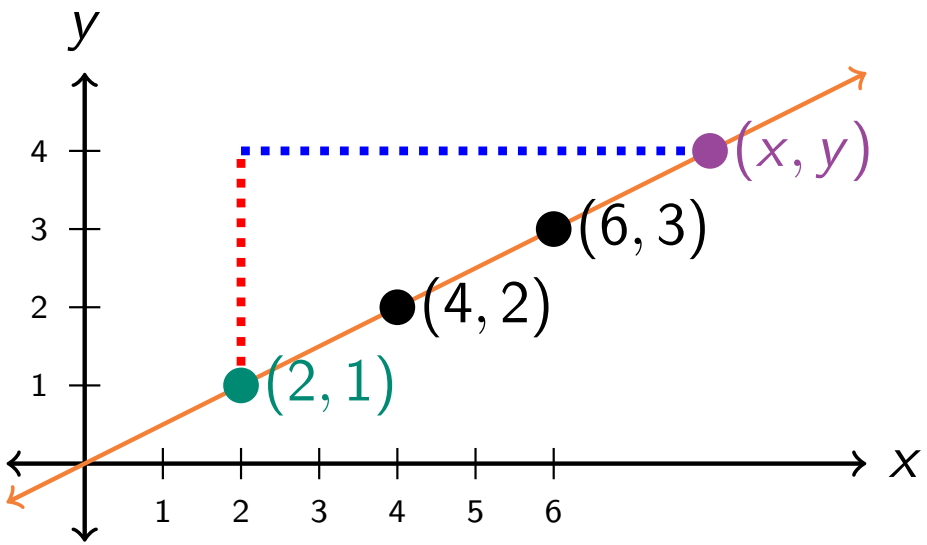
- The ratio of how far we **go up** as we **go right** is called **slope**.
- Here we **go up** by $y - 1$ and we **go right** by $x - 2$, so the slope is **still**

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



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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Homework!

- Homework is due THIS Friday. Online.
- I am heading over right now to the mathskeller
- Computers that work, assignments takes about 3 minutes
- Chapter 1 due next Friday, should take an hour if you've studied.