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Sept. 11

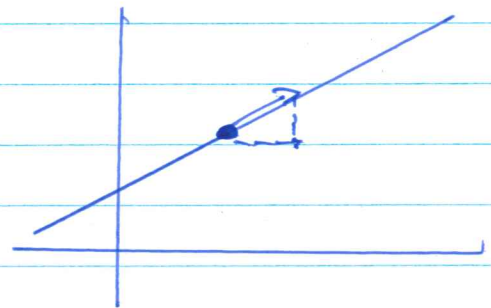
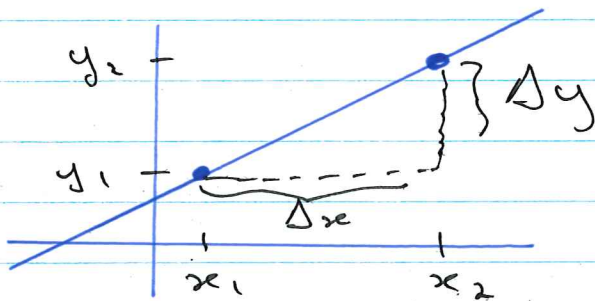
No office hours today.
Office hours next week. TBA.

When emailing me put M190 in
subject.

Labs start next week.

Lines: What information do we
need to draw a line?

Either 1) two points
or 2) one point and slope.



the slope is $m = \frac{\Delta y}{\Delta x} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$.

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Example! Find the equation of the line passing through $(-1, 1)$ and $(3, 2)$.

Find slope: $m = \frac{2-1}{3-(-1)} = \frac{1}{4}$.

Slope - y-intercept form!

$$y = mx + b.$$

$$y = \frac{1}{4}x + b.$$

Put in a point.

$$1 = \frac{1}{4}(-1) + b.$$

$$5/4 = b$$

$$\Rightarrow y = \frac{1}{4}x + 5/4.$$

Also we could use the Slope - Point form.

$$y - y_1 = m(x - x_1).$$

where (x_1, y_1) is any point.

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After we find the slope we
can write, (take $(3, 2)$)

$$y - 2 = \frac{1}{4}(x - 3)$$

Clicker Q: Which of the following
lines is parallel to
 $y - 1 = \frac{2}{3}(x - 2)$?

A) $y + 4 = \frac{3}{2}(x - 7)$

B) $y = -\frac{2}{3}(x + 1)$

C) $y + 1 = \frac{2}{3}(x - 3)$

D) $y - 6 = -\frac{3}{2}x$

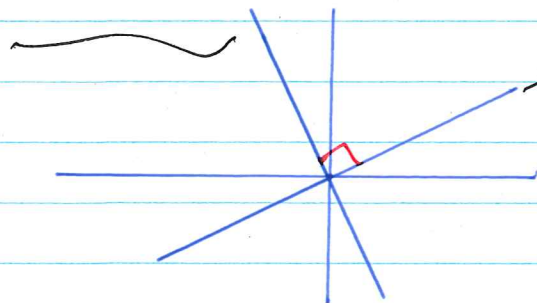
negative
reciprocal.

\Rightarrow C)

Clicker Q: Which is perpendicular?

\Rightarrow D)

negative
slope
larger
slope



positive slope
smaller slope.

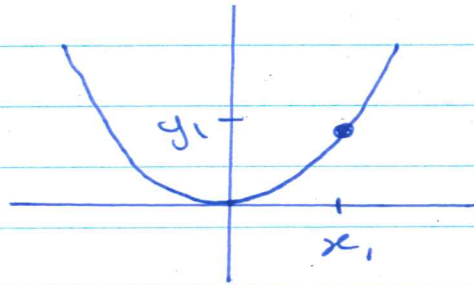
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Functions: What is a function?

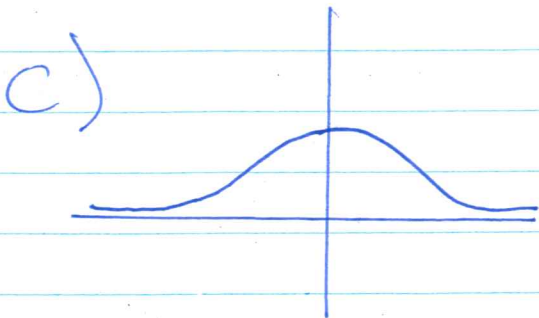
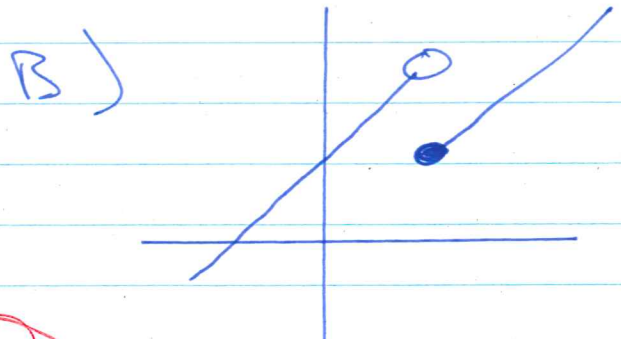
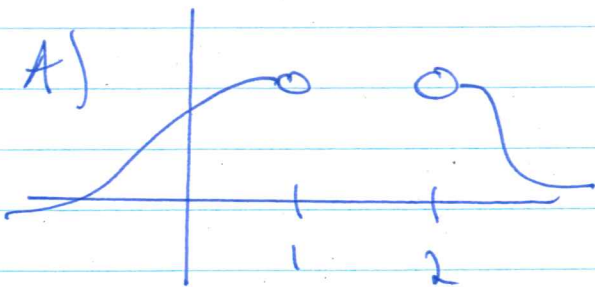
A function is a rule that takes an input and gives a unique output
(only one y for each x)

Example: $f(x) = x^2$.

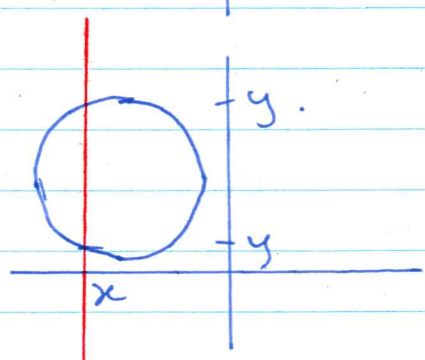


$$3 \rightarrow \boxed{f(x) = x^2} \Rightarrow 9$$

Check Q: Which of the following is not a function?



D



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So D) has two outputs for

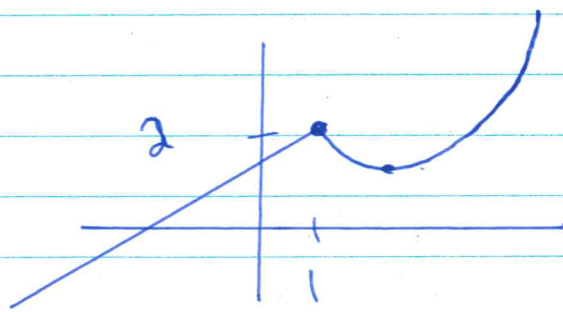
one input.

It fails the vertical line test.

A) and B) are examples of piecewise functions.

(these two happen to be discontinuous).

Example:



← Piecewise but continuous.

$$f(x) = \begin{cases} x+1 & x < 1 \\ (x-2)^2 + 1 & x \geq 1 \end{cases}$$

The values we can put into a function form the domain.

The domain of B) C) is: \mathbb{R}

• all real numbers

• $(-\infty, \infty)$

The domain of A)

is: $\{x \in \mathbb{R} : x < 1 \text{ or } x \geq 2\}$

• $(-\infty, 1) \cup (2, \infty)$

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$(-\infty, 1)$ \leftarrow does not include 1

$(-\infty, 1]$ \leftarrow does include 1

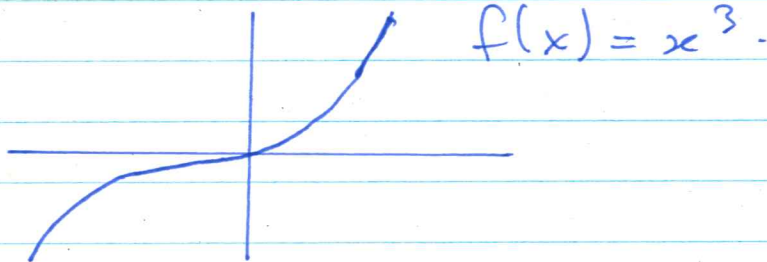
$$x \in \mathbb{R}$$

x is an element of \mathbb{R} .

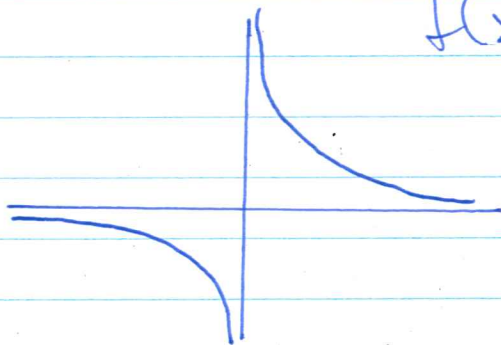
There are many kinds of functions.

- polynomials
- rational functions
- trig / exp / log. (week 2, 3)

Examples:

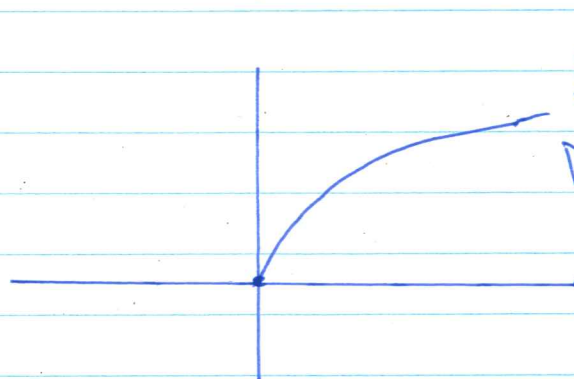


$$f(x) = x^3$$



$$f(x) = 1/x$$

Domain: $\{x \in \mathbb{R} : x \neq 0\}$



$$f(x) = \sqrt{x}$$

Domain: $\{x \in \mathbb{R} : x \geq 0\}$

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Example: $f(x) = \frac{(x+1)(x-3)}{(x-3)}$

Domain: $\{x \in \mathbb{R} : x \neq 3\}$

If $x \neq 3$ we can cancel.

$$\frac{(x+1)(x-3)}{(x-3)} = x+1$$

So we could write $f(x)$ in another way:

$$f(x) = \begin{cases} x+1 & x \neq 3 \\ \text{undefined} & x = 3 \end{cases}$$

