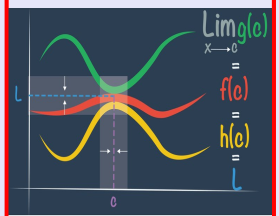
Math 261

Fall 2023

Lecture 3



Feb 19-8:47 AM

Class QZ 2 $\quad (x-h)^2+(y-k)^2=r^2 \leftarrow$ Circle

Graph $\quad x^2+(y+2)^2=4$

$\hookrightarrow x=0 \qquad y+2=0 \rightarrow y=-2$

Give domain & range

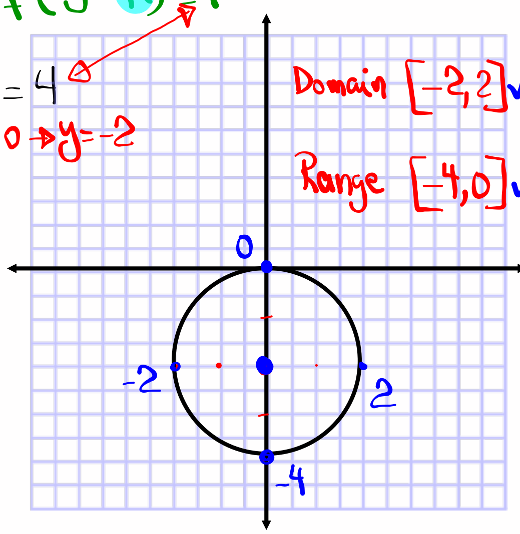
in interval notation.

Center $(0,-2)$ ✓

Radius 2 ✓

Domain $[-2,2]$ ✓

Range $[-4,0]$ ✓



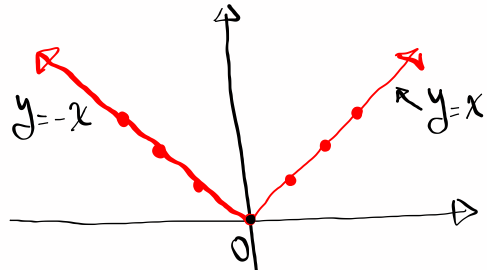
Aug 29-11:20 AM

$y = |x|$

x	y
0	0
1	1
2	2
3	3

x	y
-1	1
-2	2
-3	3

$$y = \begin{cases} -x & \text{if } x < 0 \\ x & \text{if } x \geq 0 \end{cases}$$



Domain:
$\mathbb{R}$ $(-\infty, \infty)$

Range
$[0, \infty)$

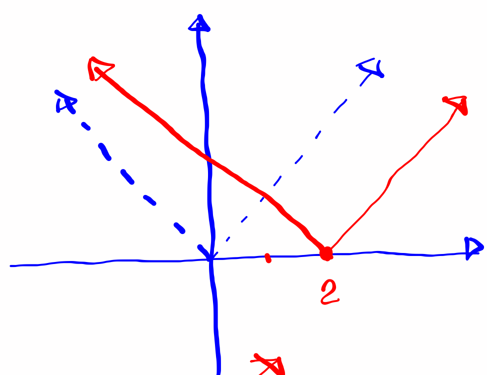
Aug 30-10:29 AM

$y = |x - 2|$

$x - 2 = 0$

$x = 2$

Shift Right 2 units

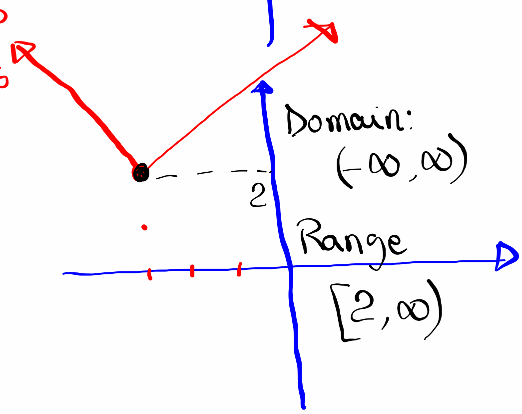


$y = |x + 3| + 2$ Move up 2 units

$x + 3 = 0$

$x = -3$

Shift left 3 units



Domain:
$(-\infty, \infty)$

Range
$[2, \infty)$

Aug 30-10:33 AM

$y = x^2 - 2x$

Replace x with $x+h$, Simplify, then Subtract the original y from it.

$(x+h)^2 - 2(x+h) - (x^2 - 2x)$

$= \underbrace{(x+h)(x+h)}_{\text{FOIL}} - 2x - 2h - x^2 + 2x$

$= \cancel{x^2} + xh + hx + h^2 \cancel{-2x} - 2h \cancel{-x^2} \cancel{+2x}$

$= \boxed{2xh + h^2 - 2h}$

Divide by h, Simplify, then evaluate for $h=0$.

$\dfrac{2xh + h^2 - 2h}{h} = \dfrac{\cancel{h}(2x + h - 2)}{\cancel{h}} = 2x + h - 2$

$= 2x + 0 - 2$

$= \boxed{2x - 2}$

take the answer, Set it equal to 0, Solve for x, then find the y Corresponding to that x.

$2x - 2 = 0$

$\boxed{x = 1}$

$y = x^2 - 2x$

$y = 1^2 - 2(1)$

$\boxed{y = -1}$

Aug 30-10:36 AM

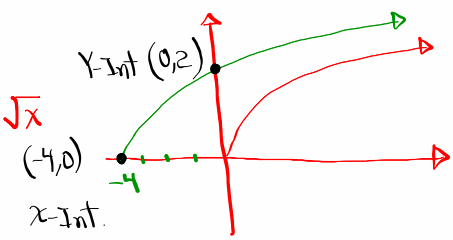
Graph $y = \sqrt{x+4}$

From Yesterday $\rightarrow y = \sqrt{x}$

$x + 4 = 0$

$x = -4$

shift left 4 units.



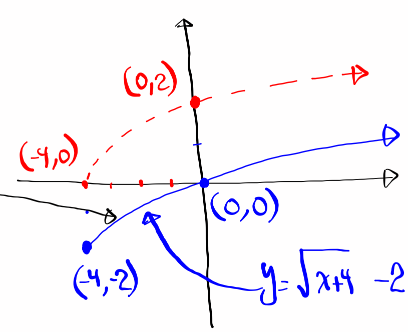
$x = 0$

$y = \sqrt{0+4} = \sqrt{4} = 2$

Shift the graph of $y = \sqrt{x+4}$ 2 units down.

Domain $[-4, \infty)$

Range $[-2, \infty)$

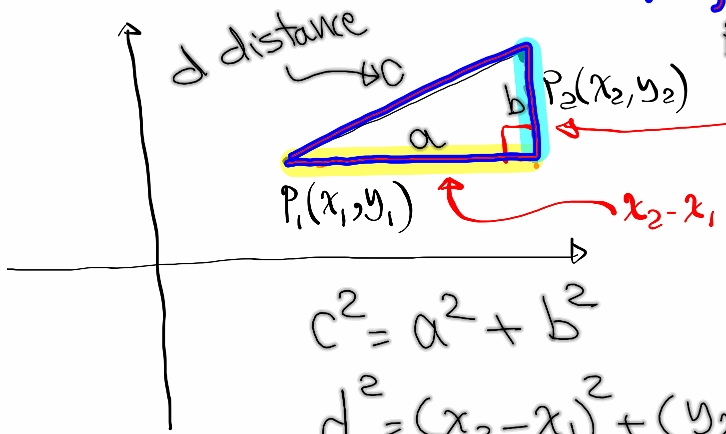


Aug 30-10:51 AM

Distance formula between two Points:

Right Triangle

Pythagorean Thrm



$a^2 + b^2 = c^2$

$$c^2 = a^2 + b^2$$

$$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

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

Aug 30-10:57 AM

find the distance between $(-2, 3)$ and $(6, 11)$

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

$$= \sqrt{(6 - (-2))^2 + (11 - 3)^2} = \sqrt{8^2 + 8^2} = \sqrt{128}$$

$$= \sqrt{64}\sqrt{2}$$

$$= \boxed{8\sqrt{2}} \approx 11.3$$

Aug 30-11:03 AM

Find an equation that all points are 4 units from a fixed Point $(3,-2)$.

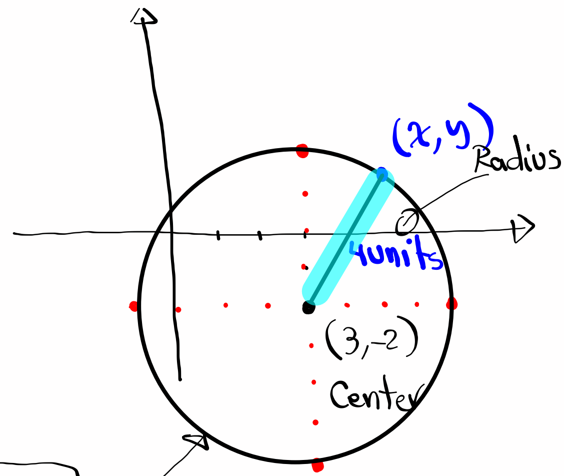
$$d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

$$4 = \sqrt{(x-3)^2+(y--2)^2}$$

$$4 = \sqrt{(x-3)^2+(y+2)^2}$$

Square both Sides

$$\boxed{16 = (x-3)^2+(y+2)^2}$$



Aug 30-11:06 AM

More from algebra

Rationalize the denominator : $\dfrac{4}{\sqrt{6}-\sqrt{2}}$

$$\frac{4}{\sqrt{6}-\sqrt{2}} = \frac{4}{\sqrt{6}-\sqrt{2}} \cdot \frac{\sqrt{6}+\sqrt{2}}{\sqrt{6}+\sqrt{2}}$$

Conjugates

Foil

$$= \frac{4(\sqrt{6}+\sqrt{2})}{\sqrt{36}\cancel{+\sqrt{12}}\cancel{-\sqrt{12}}-\sqrt{4}}$$

$6-2$

$=4$

$$= \frac{\cancel{4}(\sqrt{6}+\sqrt{2})}{\cancel{4}} = \boxed{\sqrt{6}+\sqrt{2}}$$

Aug 30-11:14 AM

Rationalize the numerator

$$\frac{\sqrt{x+h}-\sqrt{x}}{h} = \frac{\overset{A}{\sqrt{x+h}} \overset{-}{-} \overset{B}{\sqrt{x}}}{h} \cdot \frac{\overset{A}{\sqrt{x+h}} \overset{+}{+} \overset{B}{\sqrt{x}}}{\sqrt{x+h}+\sqrt{x}}$$

$(A-B)(A+B)$

$= A^2 - B^2$

$$= \frac{(\sqrt{x+h})^2 - (\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{\cancel{x}+\cancel{h} \cancel{-x}}{\cancel{h}(\sqrt{x+h}+\sqrt{x})}$$

Let $h=0$, and $x=4$,

evaluate $\longrightarrow$ $= \dfrac{1}{\sqrt{x+h}+\sqrt{x}}$

$$\frac{1}{\sqrt{4+0}+\sqrt{4}} = \frac{1}{2+2} = \boxed{\frac{1}{4}}$$

Aug 30-11:19 AM

Simplify $\dfrac{\frac{1}{x^2} - \frac{1}{4}}{x-2}$ LCD $= 4x^2$

$$= \frac{4\cancel{x^2}\cdot\frac{1}{\cancel{x^2}} - \cancel{4}x^2\cdot\frac{1}{\cancel{4}}}{4x^2(x-2)} = \frac{4-x^2}{4x^2(x-2)}$$

$A^2 - B^2$

$$= \frac{\cancel{(2-x)}(2+x)}{4x^2\cancel{(x-2)}} = \boxed{\frac{-(2+x)}{4x^2}}$$

$$\frac{a-b}{b-a} = -1$$

$$= \boxed{-\frac{2+x}{4x^2}}$$

Aug 30-11:27 AM