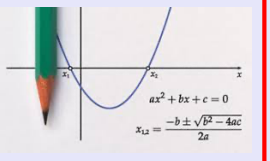
Math 125

Spring 2022

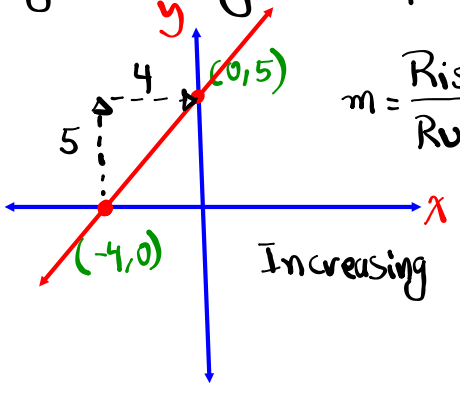
Lecture 3



Class QZ 2

Graph $5x-4y=-20$ by intercept method.

x	y
0	5 ✓
✓ -4	0



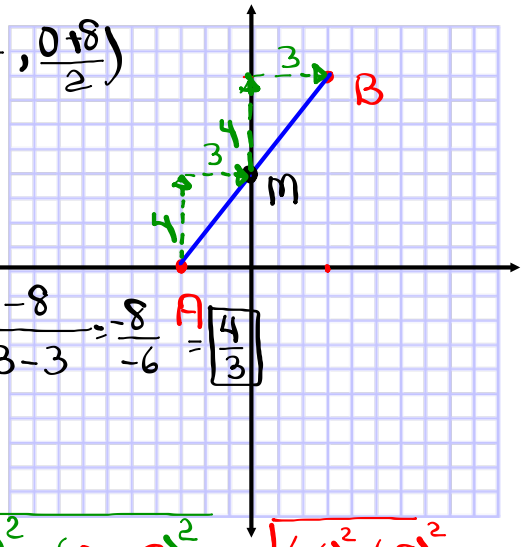
$m = \frac{\text{Rise}}{\text{Run}} = \frac{5}{4}$

Given $A(-3,0)$ and $B(3,8)$

1) Draw $\overline{AB}$

2) Find its midpoint M $\rightarrow M\left(\frac{-3+3}{2}, \frac{0+8}{2}\right) = M(0,4)$

3) Find its slope m $\rightarrow m = \frac{0-8}{-3-3} = \frac{-8}{-6} = \boxed{\frac{4}{3}}$



4) Find $d(A,B) = \sqrt{(-3-3)^2+(0-8)^2} = \sqrt{(-6)^2+(-8)^2}$

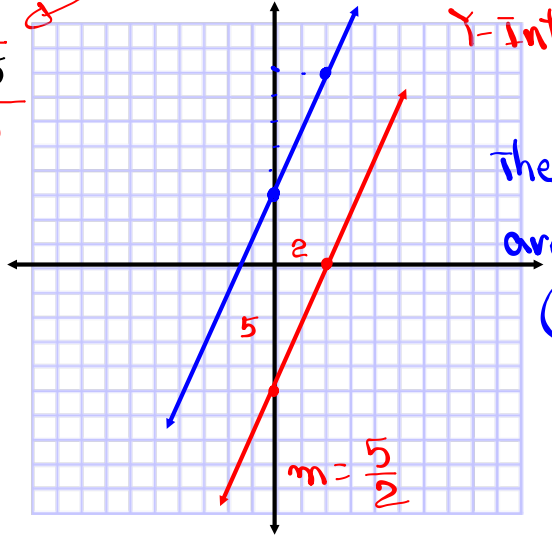
$= \sqrt{36+64} = \sqrt{100} = \boxed{10}$

Graph $5x - 2y = 10$ and $y = \frac{5}{2}x + 3$ in the same coordinate system

x	y
0	-5
2	0

$m = \frac{5}{2}$

Y-Int $(0,3)$



These two lines are parallel. $(m_1 = m_2)$

Graph $y = -\frac{4}{3}x + 5$ and $y + 4 = \frac{3}{4}(x + 5)$ in the same coordinate system

$y = mx + b$

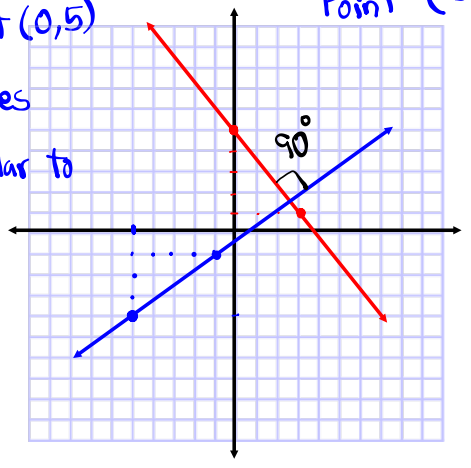
$m = -\frac{4}{3}$

Y-Int $(0, 5)$

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

$m = \frac{3}{4}$

Point $(-5, -4)$



These two lines are perpendicular to each other.

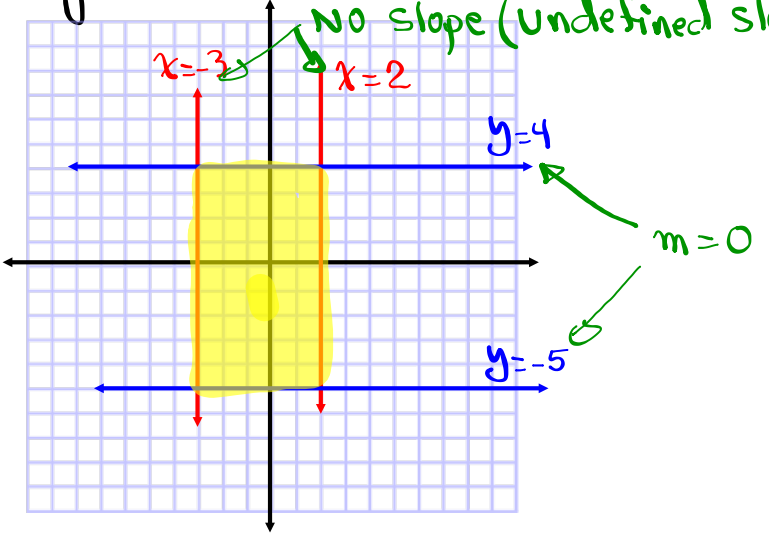
$m_1 \cdot m_2 = -1$

$\frac{-4}{3} \cdot \frac{3}{4} = -1$

V.L. H.L. V.L. H.L.

Graph $x = 2$, $y = 4$, $x = -3$, and $y = -5$.

Shade the region that is enclosed by these lines.



Simplify: $(x^5)^4 \cdot (x^{-2})^5$ $\quad (x^m)^n = x^{mn}$

$= x^{5\cdot4} \cdot x^{-2\cdot5}$ $\quad x^m \cdot x^n = x^{m+n}$

$= x^{20} \cdot x^{-10} = x^{20+(-10)} = \boxed{x^{10}}$

Solve and graph $\quad -6 \le 5x - 4 < 11$

Isolate x in the middle

$-6+4 \le 5x - 4 + 4 < 11 + 4$

$-2 \le 5x < 15$

$\frac{-2}{5} \le \frac{5}{5}x < \frac{15}{5}$

$\frac{-2}{5} \le x < 3$

Interval notation: $\left[\frac{-2}{5}, 3\right)$

Set-Builder Notation: $\{x \mid \frac{-2}{5} \le x < 3\}$ (Such that)

$Ax + By = C$ Standard Form

$y = mx + b$ Slope-Int Form

$3x + 2y = 8$

Write it in Slope-Int Form

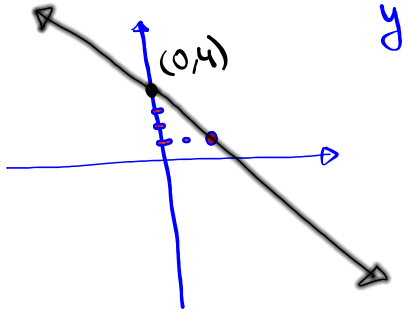
Isolate y

$3x + 2y = 8$

$2y = -3x + 8$

$y = \frac{-3}{2}x + \frac{8}{2} \Rightarrow \boxed{y = \frac{-3}{2}x + 4}$

$m = \frac{-3}{2}$, Y-Int $(0,4)$



$5x - 3y = 9$

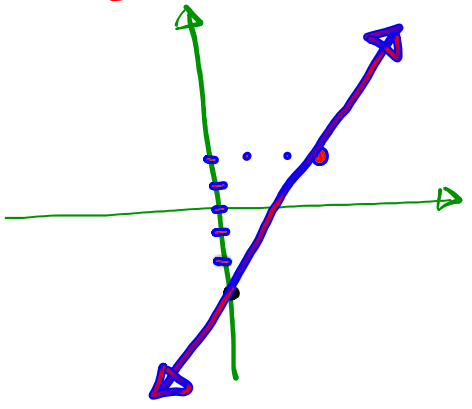
1) write in Slope-Int Form

$-3y = -5x + 9$ $\quad y = \frac{-5}{-3}x + \frac{9}{-3}$ $\quad y = \frac{5}{3}x - 3$

2) $m = \frac{5}{3}$

Y-Int $(0, -3)$

3) Graph



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

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

1) Point $(-3, 2)$

Slope $m = \frac{-2}{3}$

2) write in Slope-Int Form

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

$y - 2 = \frac{-2}{3}x - 2$

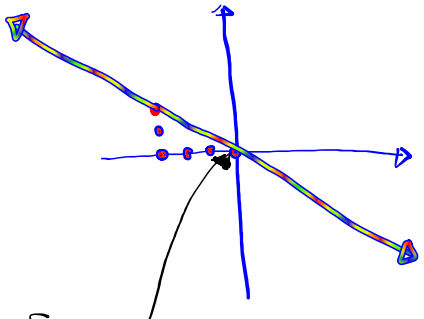
$y = \frac{-2}{3}x - 2 + 2$

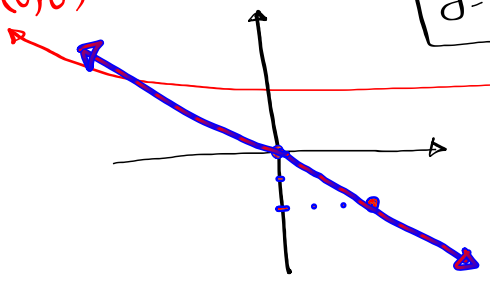
$y = \frac{-2}{3}x$

3) $m = \frac{-2}{3}$

Y-Int $(0, 0)$

4) Graph

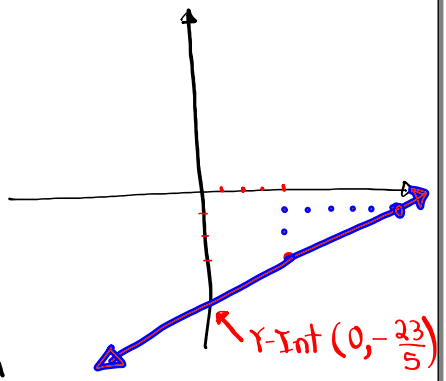




$y + 3 = \frac{2}{5}(x-4)$

1) Point $(4, -3)$
Slope $m = \frac{2}{5}$

2) Graph



3) write in Slope-Int Form

$y + 3 = \frac{2}{5}(x-4)$

$y + 3 = \frac{2}{5}x - \frac{8}{5}$

$y = \frac{2}{5}x - \frac{8}{5} - 3$

$y = \frac{2}{5}x - \frac{8}{5} - \frac{3 \cdot 5}{5}$

$= \frac{2}{5}x - \frac{8}{5} - \frac{15}{5}$

$\boxed{y = \frac{2}{5}x - \frac{23}{5}}$

Write $y + 3 = \frac{2}{5}(x-4)$ in Slope-Int Form.

LCD = 5

$5y + 5 \cdot 3 = 5 \cdot \frac{2}{5}(x-4)$

$5y + 15 = 2x - 8$

$5y = 2x - 8 - 15$

$5y = 2x - 23$

$\boxed{y = \frac{2}{5}x - \frac{23}{5}}$

$m = \frac{2}{5}$

y-Int $(0, \frac{-23}{5})$

Introduction to Functions:

Function is a formula or pattern that takes input values and returns an output value for every input value.

There is only one output value for any input value.

Input value

Function notation "for now" $f(x)$ ← output value "f of x"

ex: $f(x) = 3x - 2$

$f(0) = 3(0) - 2 = 0 - 2 = \boxed{-2}$ input $x = 0$, output $f(0) = -2$

$f(4) = 3(4) - 2 = 12 - 2 = \boxed{10}$ input 4, output 10

Given $f(x) = x^2 - 4$

Find

1) $f(0) = 0^2 - 4$ Input 0
$= 0 - 4$ output -4
$= \boxed{-4}$ ✓

2) $f(2) = 2^2 - 4$
$= 4 - 4$
Input 2 $= \boxed{0}$ ✓
output 0

3) $f(-2) = (-2)^2 - 4$
$= 4 - 4$ input -2
$= \boxed{0}$ ✓ output 0

Given $F(x) = |x - 3|$

Find

1) $F(0) = |0 - 3|$

$= |-3| = \boxed{3}$

2) $F(3) = |3 - 3|$

$= |0|$

$= \boxed{0}$

3) $F(-3) = |-3 - 3|$

$= |-6| = \boxed{6}$

\$20/hr

1 hr → \$20

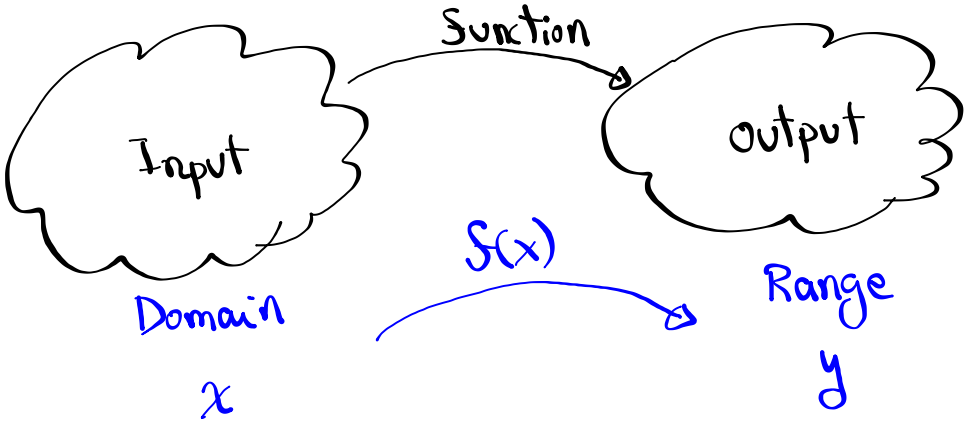
2 hrs → $2 \cdot 20 = \$40$

5 hrs → $5 \cdot 20 = \$100$

$F(x) = \boxed{20x}$

x: hrs worked

$20x$: \$ you make



$y = S(x)$

No x-value can have more than one Y-value as output.

$Ax + By = C$ $\Rightarrow$ $y = mx + b$

Standard Form of a line

Slope - Int. Form

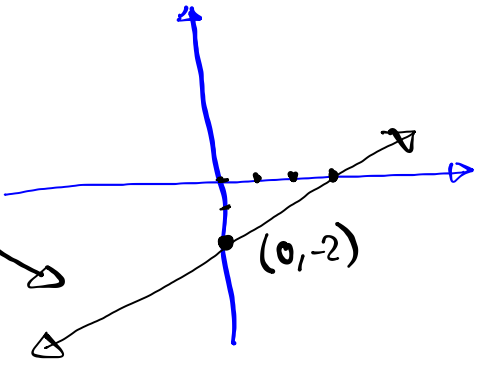
$f(x) = mx + b$

Linear Function

$f(x) = \frac{2}{3}x - 2$

$m = \frac{2}{3}$

Y-Int $(0, -2)$

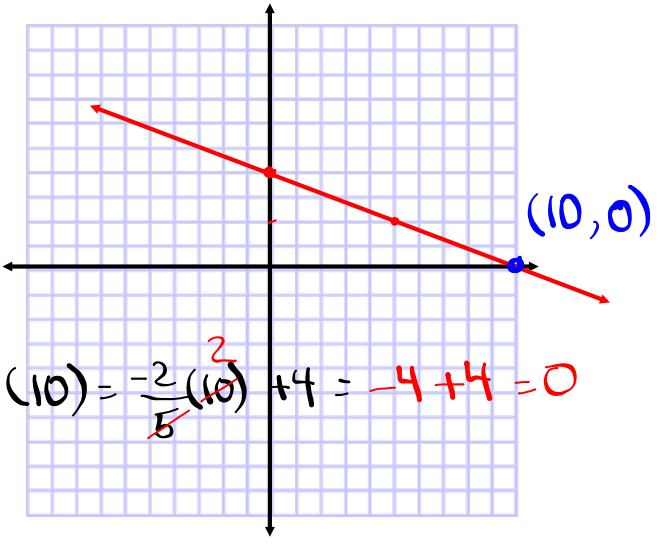


$f(x) = \frac{-2}{5}x + 4$

Y-Int $(0,4)$

$m = \frac{-2}{5}$

Draw



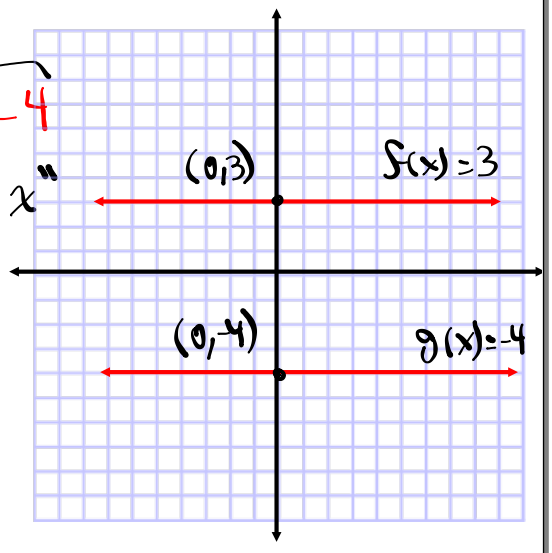
$f(10) = \frac{-2}{5}(10) + 4 = -4 + 4 = 0$

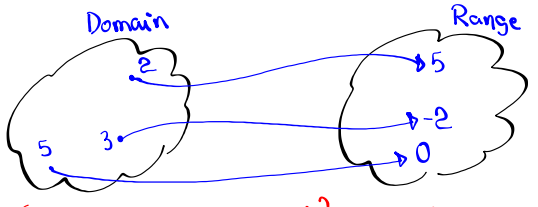
$y = b \longrightarrow f(x) = b$

Horizontal line Constant Function

ex: $f(x) = 3$, $g(x) = -4$ ($y = -4$)

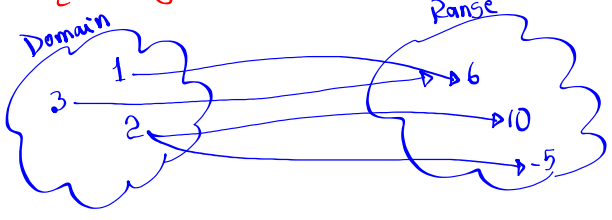
$y = 3$ "g of x"





$\{(2,5), (3,-2), (5,0)\}$ Function

$\{2,3,5\}$ Domain $\{5,-2,0\}$ Range



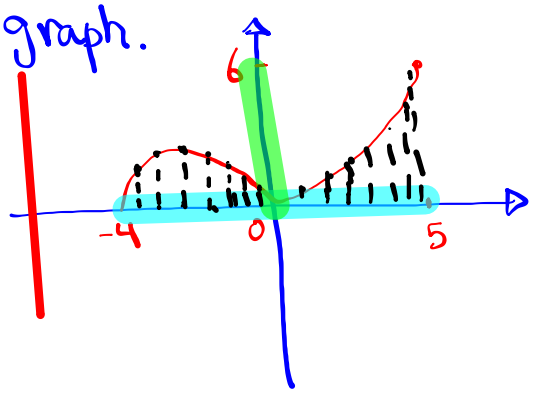
Domain: $\{1,2,3\}$, Range: $\{-5,6,10\}$

$\{(1,6), (2,10), (2,-5), (3,6)\}$ Not a Function

Same input

more than 1 output.

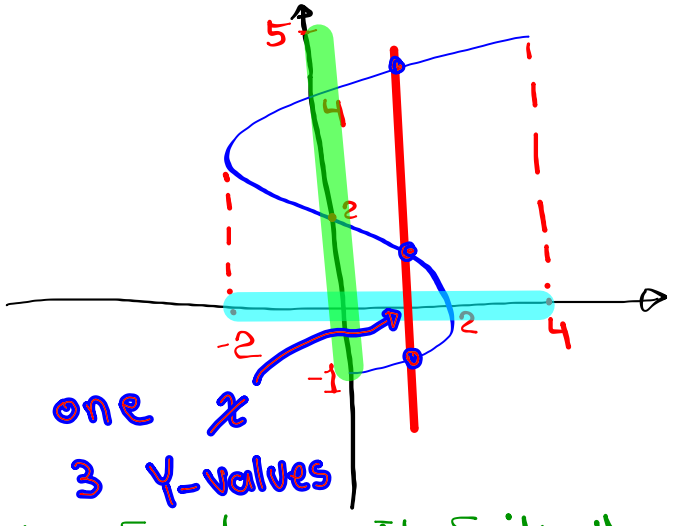
Sometimes, we can discuss functions based on a graph.



Domain $[-4, 5]$

Range $[0, 6]$

Function by Vertical line test



one x

3 y-values

Domain: $-2 \leq x \leq 4$

$[-2, 4]$

Range: $-1 \leq y \leq 5$

$[-1, 5]$

Not a Function $\Rightarrow$ It fails the vertical line test