Questions from Homework

③ c) $2x-3y=-9$, $x+y=-2$

$2x-3y=-9$

$\leftarrow$ $2x+2y=-4$

$-5y=-5$

$y=1$

$x+y=-2$

$x+1=-2$

$x=-3$

$(-3,1)$

④ c) ③ $2x-3y=-14$

② $3x+7y=48$

$6x-9y=-42$

$\leftarrow$ $6x+14y=96$

$-23y=-138$

$y=6$

$2x-3y=-14$

$2x-3(6)=-14$

$2x-18=-14$

$2x=4$

$x=2$

$(2,6)$

⑤ a) $\frac{x}{3}+\frac{y}{4}=2$ $\quad$ ×12

$\frac{2x}{3}-\frac{y}{2}=0$ $\quad$ ×6

$4x+3y=24$

$\leftarrow$ $4x-3y=0$

$8x=24$

$x=3$

$4x+3y=24$

$4(3)+3y=24$

$12+3y=24$

$3y=12$

$y=4$

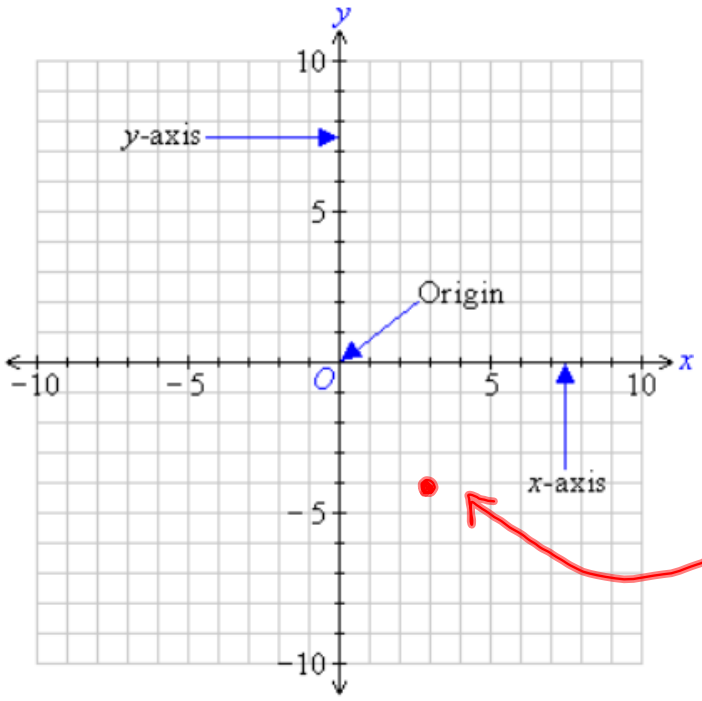
$(3,4)$

Algebra of 3-Space

But first...

Review of 2-Space

Cartesian Plane



(3, -4)

Associates each point with a pair of numbers (**ordered pair**).

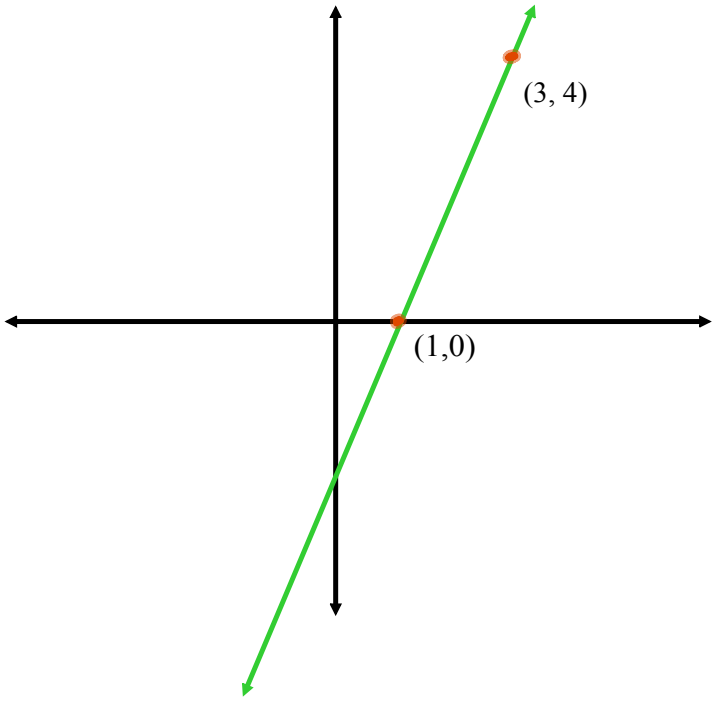
Slope

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{4-0}{3-1}$$

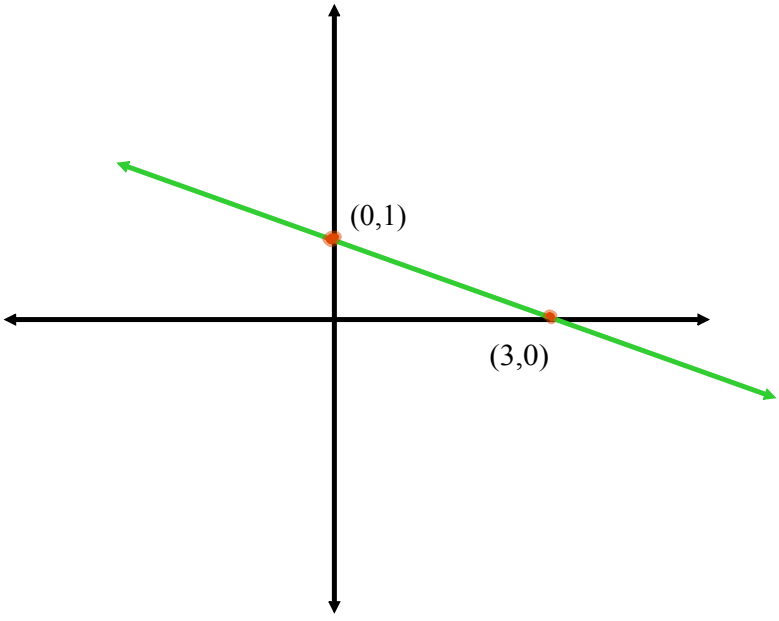
$$= \frac{4}{2}$$

$$= 2$$



$$m = \frac{1-0}{0-3}$$

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



Intercepts

x intercept

Where does it cross the x - axis? (y = 0)

Ex. $2x - 3y = 12$ (6,0)

$2x - 3(0) = 12$

$2x = 12$

$x = 6$

y intercept

Where does it cross the y - axis? (x = 0)

Ex. $2x - 3y = 12$ (0,-4)

$2(0) - 3y = 12$

$-3y = 12$

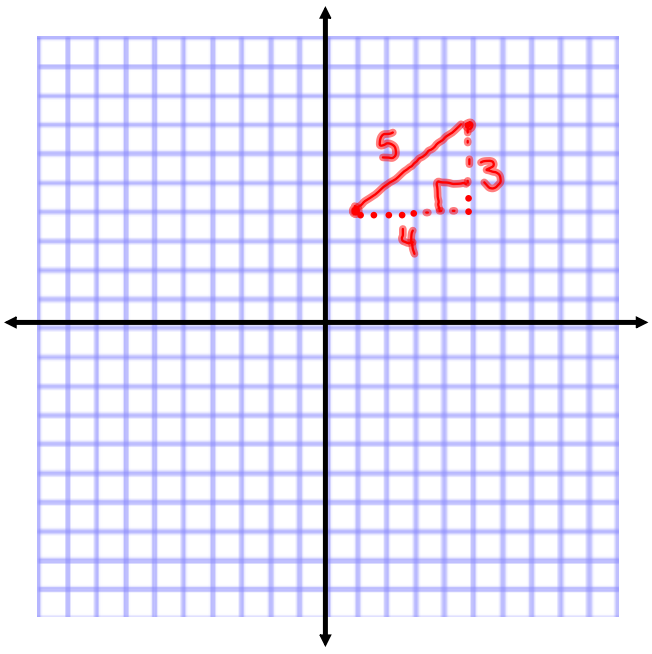
$y = -4$

Distance Between Points

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

Find the distance between the points (1,4) and (5, 7)

$$d = \sqrt{(5-1)^2 + (7-4)^2}$$
$$= \sqrt{(4)^2 + (3)^2}$$
$$= \sqrt{16+9}$$
$$= \sqrt{25}$$
$$= 5$$



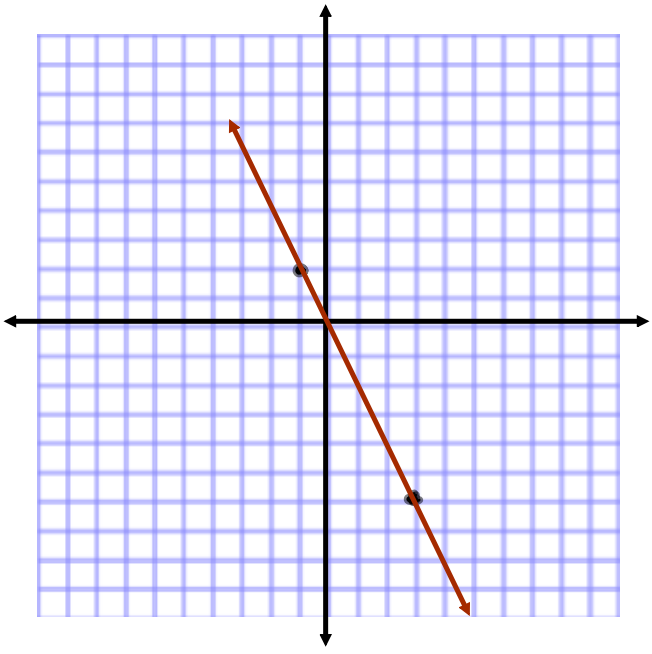
Midpoint

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Find the midpoint of the segment connecting (-1,2) and (3,-6)

$$M = \left(\frac{-1+3}{2}, \frac{2+(-6)}{2} \right)$$

$$= (1, -2)$$



Plotting Linear Relations

Use a table of values and intercepts to plot the function...

Slope / y intercept

$y = -2x + 4$

$m = \frac{-2}{1} = \frac{\text{rise}}{\text{run}}$

$b = 4 \Rightarrow (0,4)$

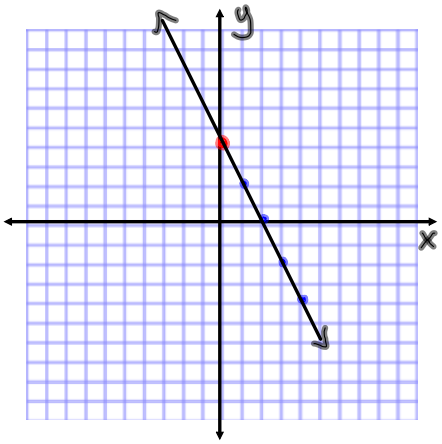
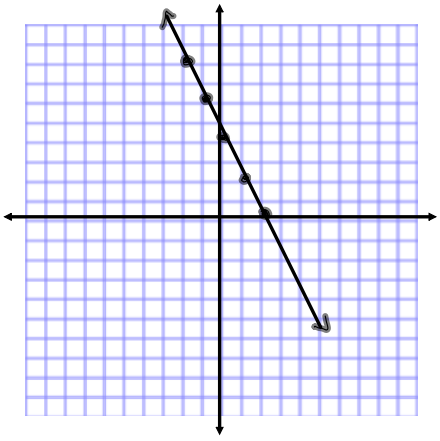


Table of Values

$y = -2x + 4$

x	y
-2	8
-1	6
0	4
1	2
2	0



Intercepts

$y = -2x + 4$

x intercept ($y=0$)

$y = -2x+4$

$0 = -2x+4$

$2x = 4$

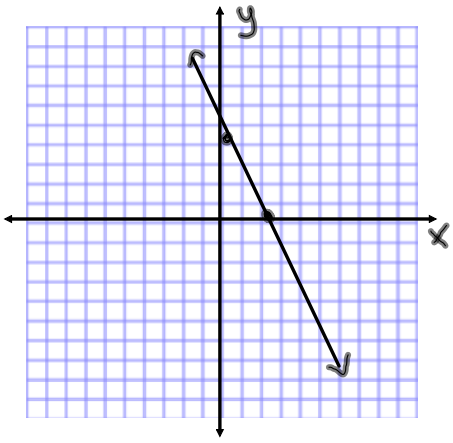
$x = 2 \Rightarrow (2,0)$

y intercept ($x=0$)

$y = -2x+4$

$y = -2(0)+4$

$y = 4 \Rightarrow (0,4)$



Solving Systems of Equations with 2 Unknowns

1. Elimination

$3x + 5y = 8$

$x + 2y = 3$

$3x+5y=8$

$\ominus\ 3x+6y=9$

$-y=-1$

$y=1$

$x+2y=3$

$x+2(1)=3$

$x+2=3$

$x=1$

$(1,1)$

2. Substitution

$2x + 3y = 26$

$y = x + 2$

$2x+3(x+2)=26$

$2x+3x+6=26$

$5x+6=26$

$5x=20$

$x=4$

$y=x+2$

$y=4+2$

$y=6$

$(4,6)$

3. Comparison

$y = 3x + 6$

$y - 2x = -4$

$y=3x+6$

$y=2x-4$

$3x+6=2x-4$

$3x-2x=-4-6$

$x=-10$

$y=3(-10)+6$

$y=-30+6$

$y=-24$

$(-10,-24)$

4. Graphing

$x - y = 1$

$2x + y = 5$

$-y=-x+1$

$y=x-1$

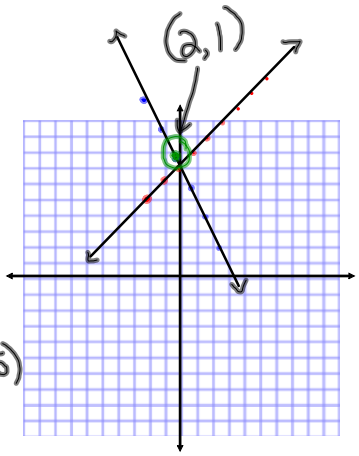
$m=\frac{1}{1}$

$b=-1\ \ (0,-1)$

$y=-2x+5$

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

$b=5 \Rightarrow (0,5)$



Homework

Phone Plan A

Long Distance Minutes	Cost ($)
0	10
30	13
90	19
150	25

Phone Plan B

Long Distance Minutes	Cost ($)
0	15
40	18.20
60	19.80
150	27

Is there any instance that the plans are the same for the same number of minutes?

Equation of a line: $m(x - x_1) = y-y_1$

ALGEBRA OF 3-SPACE

Coordinate geometry that represents space in **three** dimensions, with the axes at right angles to each other. Two axes are on the horizontal plane and one axis is on the vertical plane.

Plotting Points Using Intercepts

As in two dimensions...

u intercept can be found when $c = 0$ and $f = 0$

(u,c,f) ⟶ (u,0,0)

c intercept can be found when $u = 0$ and $f = 0$

(u,c,f) ⟶ (0,c,0)

f intercept can be found when $u = 0$ and $c = 0$

(u,c,f) ⟶ (0,0,f)