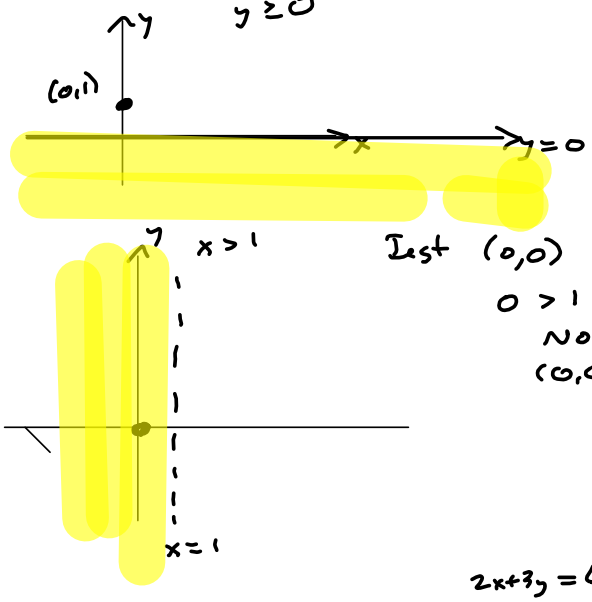
1340 Harry Mills

(1) We graph the region corresponding to the system of inequalities. Find and label the corner points of the feasible region. (GOOD STUFF)

$y \geq 0$

$x > 1$

$2x+3y \leq 6$



Scratch out the bad stuff

(0,0) on boundary.

Test ANY point NOT on the boundary.

(0,1)

$1 \geq 0$? Yes

(0,1) Good.

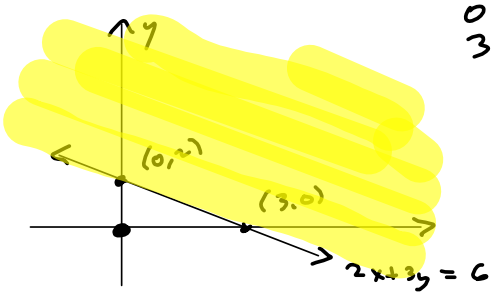
Test (0,0)

$0 > 1$?

No.

(0,0) BAD!

$2x+3y \leq 6$



$2x+3y = 6$

x	y
0	2
3	0

$2(0)+3y=6 \rightarrow y=2$

$2x+3(0)=6$

$2x=6$

$\frac{2x}{2} = \frac{6}{2} = 3$

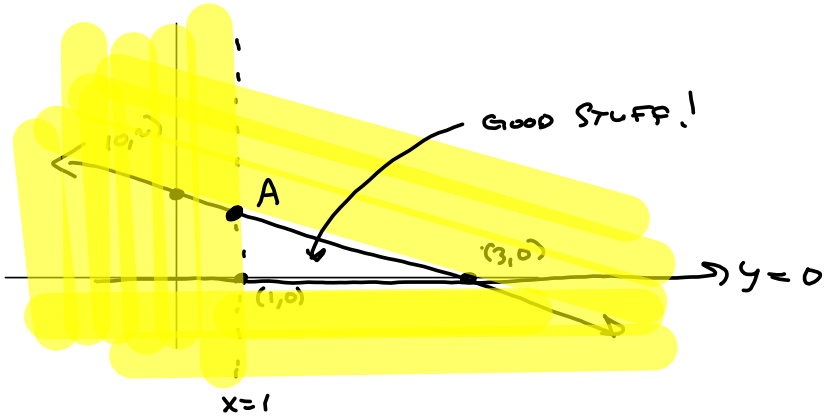
$x=3$

$2(0)+3(0) \leq 6$?

$0 \leq 6$?

Yes. (0,0) Good.

Answer next page...



A: Intersection of $x=1$ & $2x+3y=6$

$\rightarrow 2(1)+3y=6$

$2+3y=6$

$-2 \quad =-2$

$3y=4$

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

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

$A=(1,\frac{4}{3})$

$\frac{3x}{3} < \frac{4}{3}$

$x<\frac{4}{3}$

$-3x<4$

$x>-\frac{4}{3}$

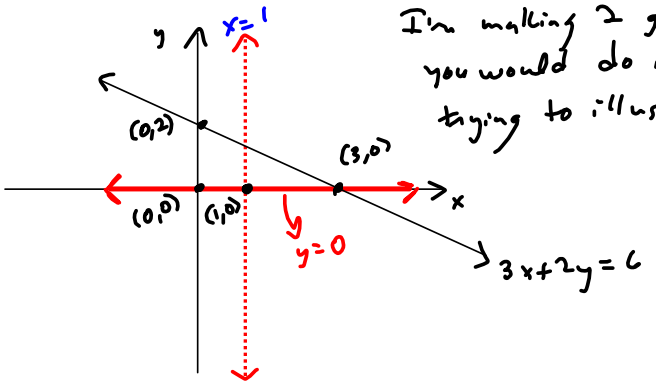
$\frac{-3x}{-3} > \frac{4}{-3}$

BAD

$\frac{-3x}{-3} > \frac{4}{-3}$

$-3x<4$

$x>\frac{4}{-3}$

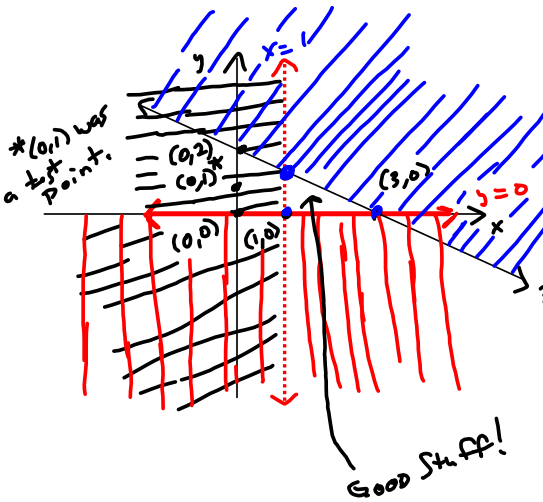


I'm making 2 graphs, but you would do it on one graph. I'm trying to illustrate the process.

FINAL GRAPH ON PAGE 3

"scratch out the bad stuff"

After building the lines and labeling them, as above, I would then add the shading layers for the inequalities.



$x > 1$
check $(0,0)$:
$0 > 1$?
No
$(0,0)$ Bad

$y \geq 0$
Check any point not on y-axis:
$(0,1)$:
$1 \geq 0$?
Yes.
$(0,1)$ Good

$3x+2y \leq 6$
check $(0,0)$:
$3(0)+2(0) \leq 6$?
$0 \leq 6$?
Yes
$(0,0)$ Good

See the triangle in the middle?
THAT is the "feasible region."
& that's what we want!

② We find the distance from $\overset{(x_1,y_1)}{(2,3)}$ to $\overset{(x_2,y_2)}{(-7,2)}$.

$P = (x_1,y_1)$, $Q = (x_2,y_2)$

$\Rightarrow$ distance from P to Q is

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

$= \sqrt{(2-(-7))^2 + (-3-2)^2}$

$= \sqrt{(2+7)^2 + (-5)^2}$

$= \sqrt{9^2+5^2} = \sqrt{81+25}$ $= \boxed{\sqrt{106} = d(P,Q)}$

(3) We find the midpoint of $\left(\frac{\pi}{2}, \sqrt{3}\right)$ & $\left(\frac{\pi}{3}, -2\right)$. Then approximate to 4 places.

Midpoint of (x_1, y_1) & (x_2, y_2) is

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

$$= \left(\frac{\frac{\pi}{2}+\frac{\pi}{3}}{2}, \frac{\sqrt{3}+(-2)}{2}\right) = \boxed{\left(\frac{5\pi}{12}, \frac{\sqrt{3}-2}{2}\right)}$$

Scratch: $\frac{1}{2}\left(\frac{\pi}{2}+\frac{\pi}{3}\right) = \frac{1}{2}\left(\frac{\pi}{2}\cdot\frac{3}{3}+\frac{\pi}{3}\cdot\frac{2}{2}\right) = \frac{1}{2}\left(\frac{3\pi+2\pi}{6}\right)$

LCD $= 6 = 2\cdot 3$

$= \frac{1}{2}\left(\frac{5\pi}{6}\right) = \frac{5\pi}{12}$

(4) Let $A = (1,2)$, $B = \overset{(x_1,y_1)}{(-4,-3)}$, $C = \overset{(x_2,y_2)}{(-5,0)}$. We show they're the vertices of a right triangle by the converse of the Pythagorean Theorem.

$$a^2 = d(A,B)^2 = (1-(-4))^2 + (2-(-3)) = (1+4)^2 + (2+3)^2$$

$$= 5^2 + 5^2 = 50$$

$$b^2 = d(A,C)^2 = (1-(-5))^2 + (2-0)^2 = (1+5)^2 + 2^2 = 36+4 = 40$$

$$c^2 = d(B,C)^2 = (-4-(-5))^2 + (-3-0)^2 = (-4+5)^2 + 3^2 = 1+9 = 10$$

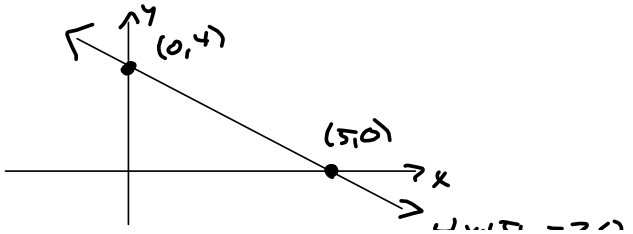
$\boxed{c^2 + b^2 = a^2}$ $\Longrightarrow$ we have a right triangle.

(5) Graph $4x+5y=20$ by intercept method.

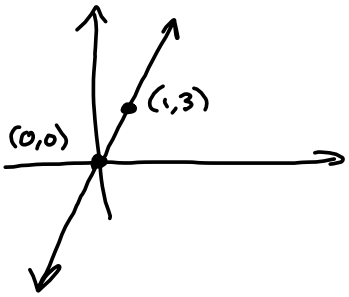
x	y
0	4
5	0

$5y=20 \Rightarrow y=\frac{20}{5}=4$

$4x=20 \Rightarrow y=\frac{20}{4}=5$



6. (5 pts) Graph $y=3x$ by using its intercept and any other point on its graph.

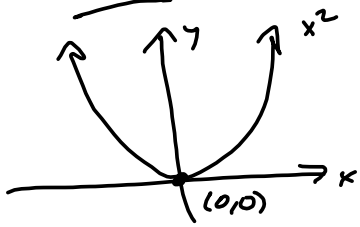


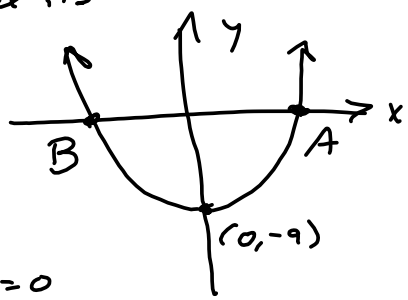
x	y
0	0
1	3

$3(1)=3$

7. (5 pts) Graph $y = x^2 - 9$ by shifting the graph of $y = x^2$. Show and label its vertex.
BONUS: (2 pts) Find and label its x- and y-intercepts.

(7) Graph $y = x^2 - 9$ by shifting the graph of $y = x^2$. Show & label its vertex.
Bonus Find & label its intercepts.





$x^2 - 9 = 0$

$x^2 = 9$

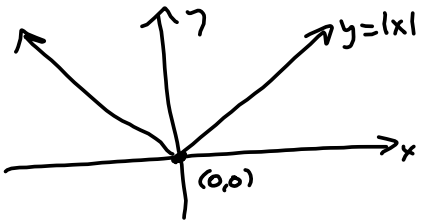
$\sqrt{x^2} = \sqrt{9}$ } Skip is OK.

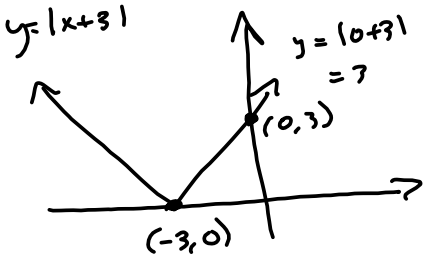
$|x| = 3$

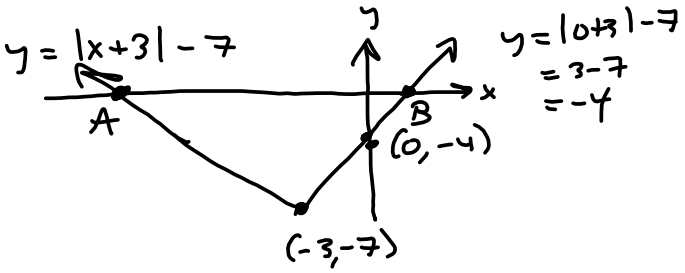
$x = \pm 3$ ⇝ $(3, 0) = A$, $(-3, 0) = B$

(8) We graph $y = |x+3| - 7$ by shifting $y = |x|$ in 2 steps.
Bonus we show x- & y-ints.

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







$|x+3| - 7 = 0$

$|x+3| = 7$

$x + 3 = \pm 7$

$x = -3 \pm 7$ ⇝ $-3+7 = 4$, $-3-7 = -10$

$A = (-10, 0)$, $B = (4, 0)$

Click here for the original, complete set of notes for Week 1 Assignment.