M → La Paz Comp Lab.
W → MTL 123C

Office Hour Location Change.

Jan 24
§1.2

1.7 Quiz → Friday

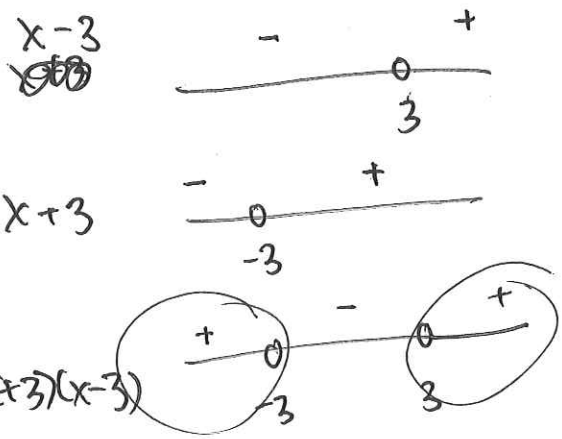
1.7 continued

Dealing w/ absolute value inequalities:

Ex. (a) solve the inequality $x^2 - 9 \geq 0$

Last time:

$(x-3)(x+3) \geq 0$



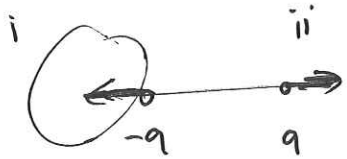
$(-\infty, -3] \cup [3, \infty)$

New:

$\sqrt{x^2} \geq \sqrt{9}$

$|x| \geq 3$

$(-\infty, -3] \cup [3, \infty)$



(b) $|3x-2| \leq 9$ ← size of $3x-2$ is smaller than 9.

$-9 \leq (\quad) \leq 9$

$-9 \leq 3x-2 \leq 9$

$-7 \leq 3x \leq 11$

$-\frac{7}{3} \leq x \leq \frac{11}{3}$

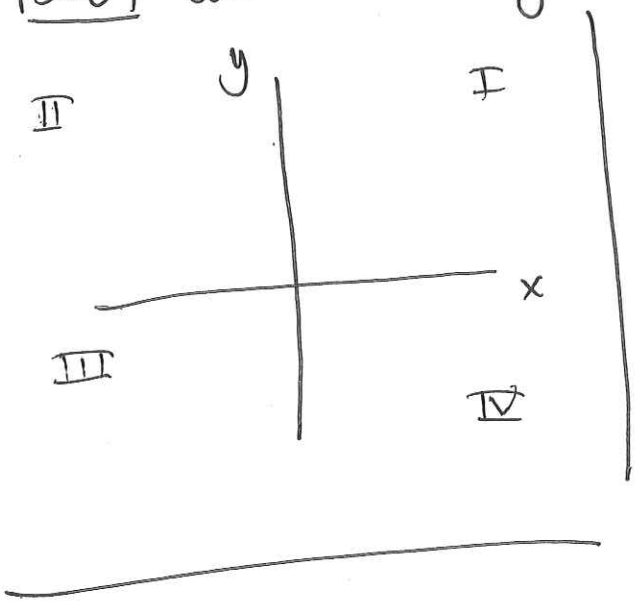
(c) $|3x-2| \geq 9$

i $3x-2 \leq -9$ or ii $3x-2 \geq 9$

$3x \leq -7$

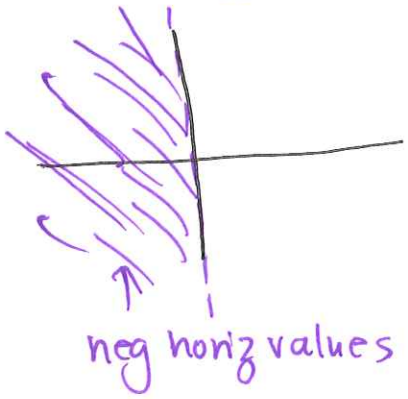
$x \leq -\frac{7}{3}$ or $x \geq \frac{11}{3}$

§1.8 Coord Geometry



Ex: Graphing Regions of inequality:

(a) $\{(x,y) \mid x<0\}$

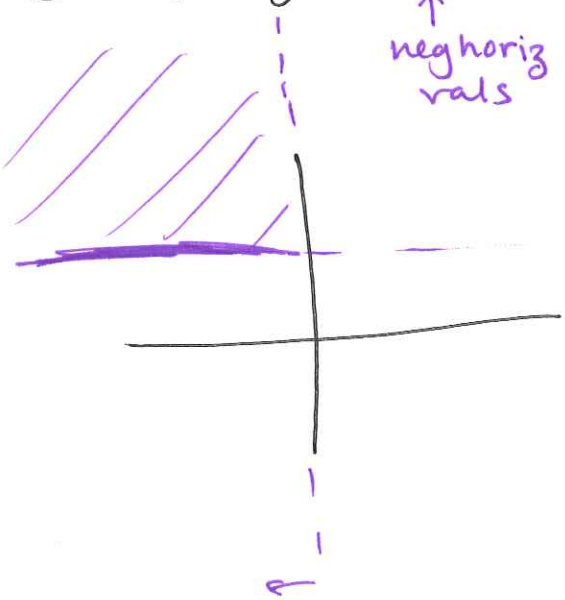


neg horiz values

(b) $\{(x,y) \mid x<0, y\geq 2\}$

neg horiz vals

vertically higher than 2 or equal.

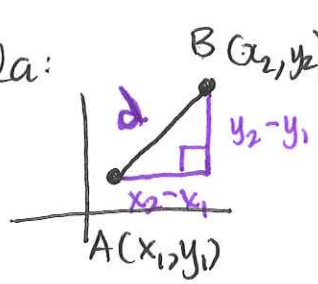


(c) $\{(x,y) \mid x<y\}$

Distance Formula:

$A = (x_1, y_1)$

$B = (x_2, y_2)$

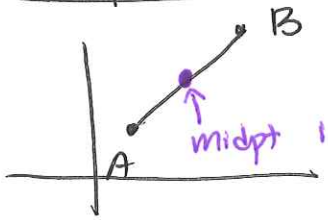


$d(A,B)$ = length of line segment $\overline{AB}$

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

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

Midpoint Formula:



midpt is in the middle both vertically and horizontally.

midpt = (average the horiz coords , average the vertical coords)

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

Example: (a) Find the distance b/t $A(-1, -3)$ ~~$B(5, 7)$~~

$B(1, 5)$

(b) Find the midpt of $\overline{AB}$.

(a) $d = \sqrt{2^2 + 8^2} = \sqrt{68} = 2\sqrt{17}$

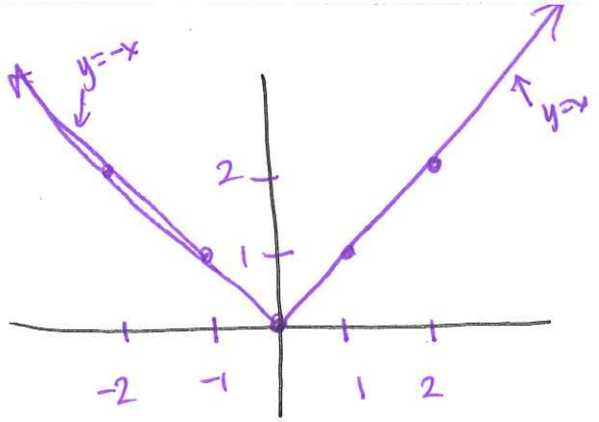
(b) midpt: $\left(\frac{-1+1}{2} , \frac{-3+5}{2} \right) = (0, 1)$

$\frac{-1+1}{2} = 0$

Next: Sketching graphs by plotting points.

Example: (a) Sketch $y = |x|$.

x	y
-2	2
-1	1
0	0
1	1
2	2



Recall = $|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$ We'll do this in Ch2!

Def: An intercept of a graph is a point which intersects an axis.

y-int: intersects y-axis; $(x=0)$

x-int: intersects x-axis. $(y=0)$

Find all intercepts:

(a) $y = x^2 - x - 6$.

y-int: $y = 0^2 - 0 - 6$

$y = -6$

$\boxed{(0, -6)}$

x-int: $0 = x^2 - x - 6$

$0 = (x-3)(x+2)$

$x = 3, -2$

$\boxed{(3,0), (-2,0)}$

(b) $y = \dfrac{Ax+B}{Cx+D}$

A, B, C, D are nonzero real constants.

y int: $y = \frac{A(0)+B}{C(0)+D} = \frac{B}{D}$ $\boxed{(0, B/D)}$

x int: $0 = \frac{Ax+B}{Cx+D} \Rightarrow 0 = Ax+B \Rightarrow \frac{-B}{A} = x$

(mult both sides by $Cx+D$)

$\boxed{(-B/A, 0)}$

(c) $(x-2)^2 + (y+3)^2 = 25$

x int: Set $y=0$

$(x-2)^2 + (3)^2 = 25$

$(x-2)^2 = 16$

$|x-2| = 4$

$x-2 = \pm 4$

$x = 2 \pm 4$

$x = 6, -2$

$\boxed{(6,0), (-2,0)}$

y int: Set $x=0$.

$\underbrace{(-2)^2}_{4} + (y+3)^2 = 25$

$(y+3)^2 = 21$

$|y+3| = \sqrt{21}$

$y+3 = \pm\sqrt{21}$

$y = -3 \pm \sqrt{21}$

$\boxed{(0, -3 \pm \sqrt{21})}$

Equation of a circle:

- x^2, y^2 are the largest powers of x, y
- coeff and sign of x^2 and y^2 match.

$\Rightarrow$ equation of circle.

STD form of a circle:

$$(x-h)^2 + (y-k)^2 = r^2$$

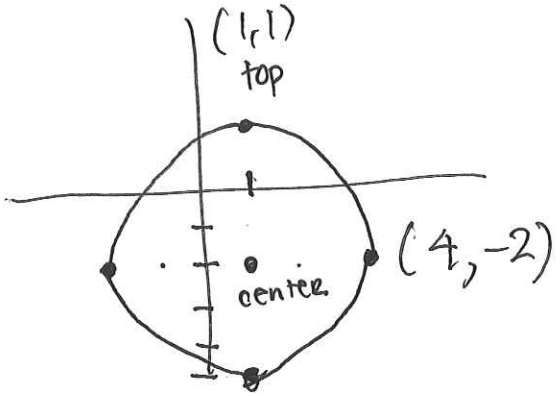
(h,k) = center

r = radius.

Ex: Graph the equation:

(a) $(x-1)^2 + (y+2)^2 = 9$

$(h, k) = (1, -2)$ $\quad r = 3$



(b) $x^2 + y^2 - 2y + 6 = 12$

complete the square.

$x^2 + (y^2 - 2y + 1 - 1) = 12$

$x^2 + (y-1)^2 - 1 = 12$

$x^2 + (y-1)^2 = 13$

center: $(0, 1)$ $\quad$ rad: $\sqrt{13} \approx 3.6$

↓

use this to sketch approx graph.