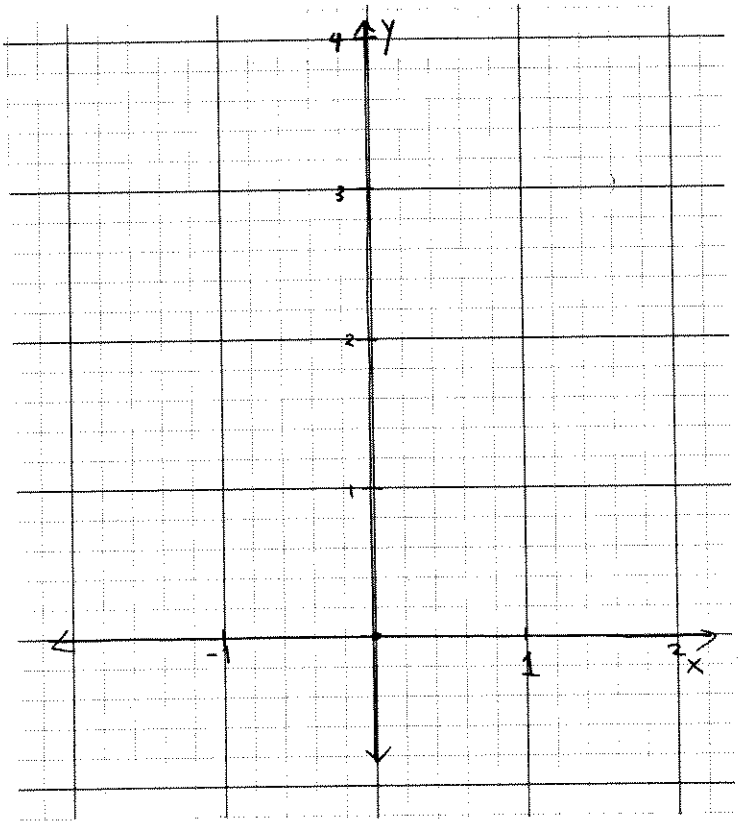
Math 1210-2
Wed Aug 29

0.4: Graphs of equations, and how to translate, stretch, and reflect them

Definition A The graph of an equation (with variables x, y) is the set of all points (x, y) for which the equation is true. (A sketch of the graph is a picture which shows the graph)

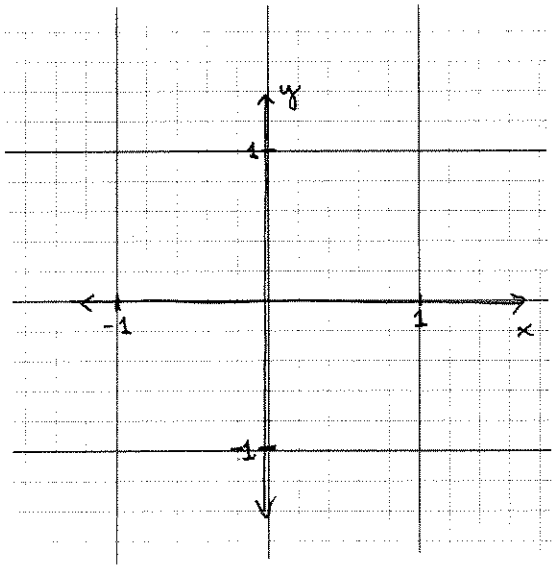
Exercise 1 Fill in the table below and use it to sketch the graph of $y = x^2$, for $|x| \leq 2$

x	x^2
0	
1	
-1	
± 2	
$\pm .2$	
$\pm .4$	
$\pm .6$	
$\pm .8$	
± 1.5	



Exercise 2: Find points on the graph of $x^2 + y^2 = 1$ and then use the Pythagorean Theorem to sketch the graph.

x	y



Exercise 3 Moving points in the plane

A point (a,b) is plotted ($a>0, b<0$, in this case)
Numbers h, k are indicated ($h>0, k>0$ in this case)
Plot the following points, describe geometrically.

(i) $(-a,b)$

(ii) $(a,-b)$

(iii) $(-a,-b)$

(iv) (b,a)

(v) $(a+h,b)$

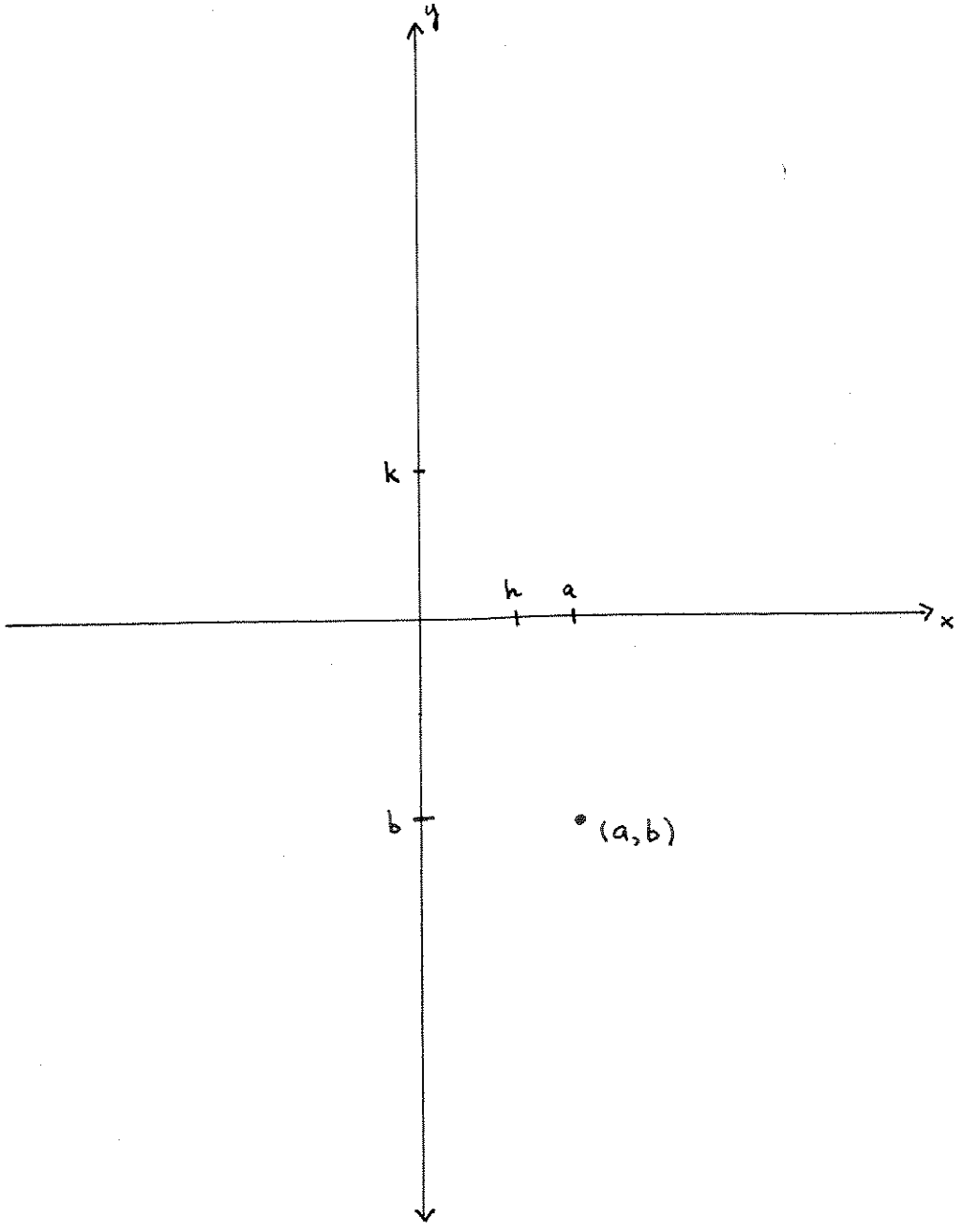
(vi) $(a,b+k)$

(vii) $(a+h,b+k)$

(viii) $(2a,2b)$

(ix) $(2a,3b)$

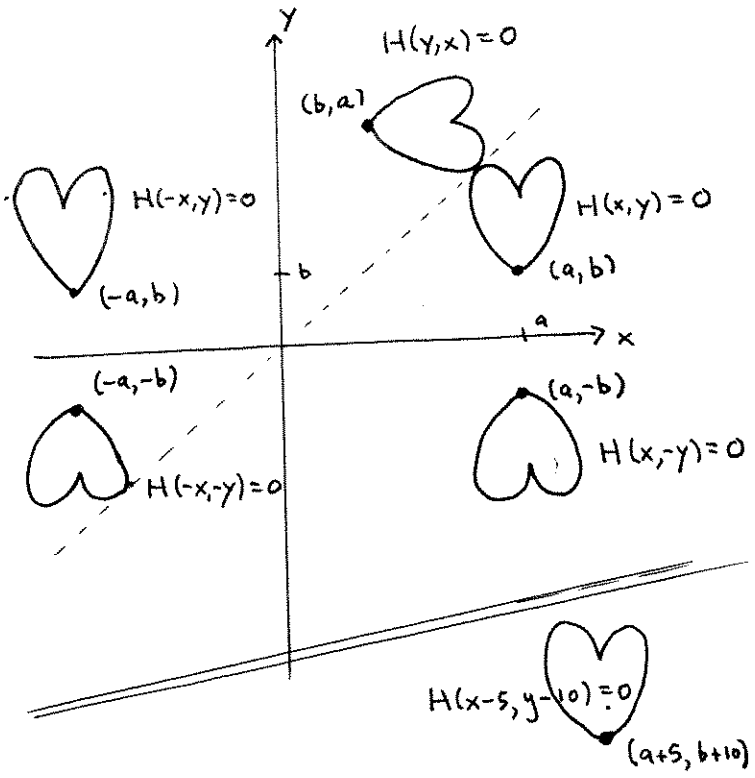
(x) $(\frac{1}{3}a,\frac{1}{3}b)$



Reflecting graphs

A sketch of the graph $F(x,y) = G(x,y)$
(or, $H(x,y) = 0$)
is shown.

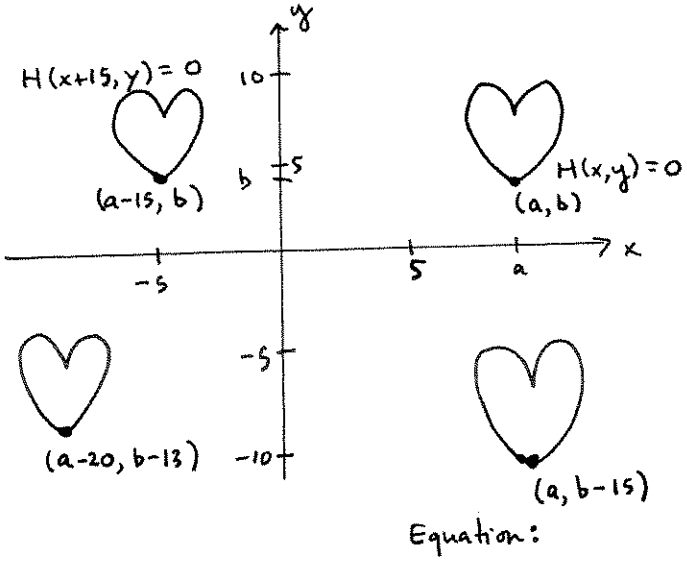
Exercise 4 Explain why the related equations have the particular reflected graphs.



Translating graphs

Exercise 5 Explain why the related equations have the particular translated graphs.

Notice : the truth seems "reversed"!



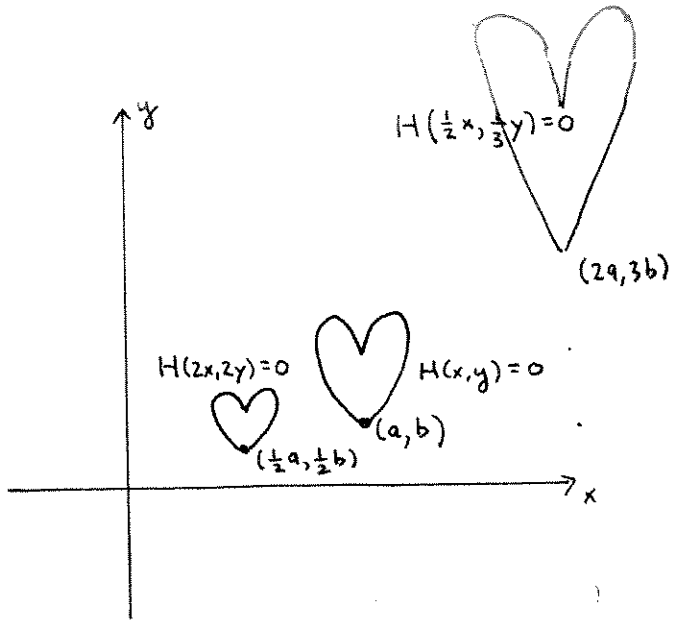
Equation:

- If you replace x with x-h
  " " y with y-k

  the graph moves h units to the right and k units up !!

stretching graphs

Exercise 6 : Explain why the related equations have the indicated graphs counterintuitive!



- If you replace x with cx
  y with dy
  the graph is stretched
  by $\frac{1}{c}$ in x-dir
  $\frac{1}{d}$ in y-dir!

Exercise 7 Sketch the graphs of (parts of)

(i) $y=-x^2$

(ii) $x=y^2$

(iii) $y=x^2+2$

(iv) $y=(x+2)^2$

(v) $(x-3)^2+(y+2)^2=1$

(vi) $\left(\frac{x}{3}\right)^2+\left(\frac{y}{2}\right)^2=1$