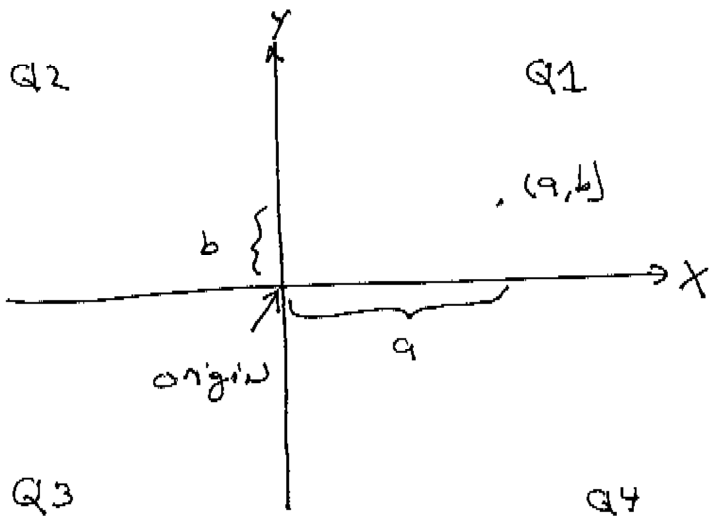
Basic Tools, Part 1



We could write Q1 as $Q1 = \{ (x,y) \mid x>0 \text{ and } y>0 \}$

what we are talking about.

condition

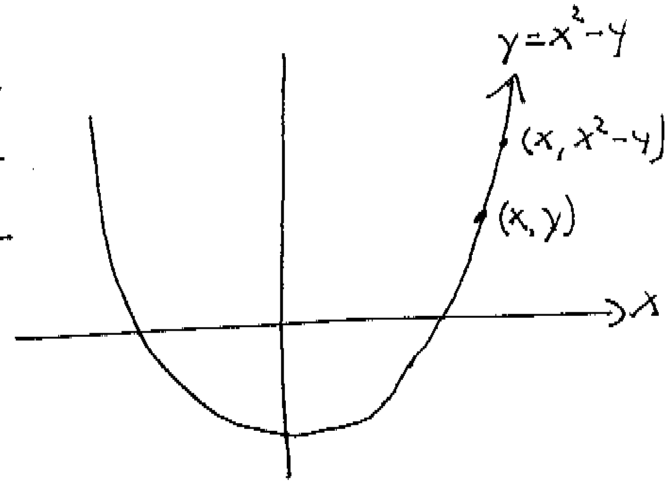
such that the condition is satisfied

The solutions to $y = x^2 - 4$ are $\{ (x,y) \mid y = x^2 - 4 \}$

~~HORRIBLE~~!

Graph the solutions.

x	-3	-2	-1	0	1	2	3
y	5	0	-3	-4	-3	0	5



2.1a
2/3

Intro the Calculator

plot $y1 = x^2 - 4$ (or x ^ 2 - 4)

What window? ... use table.

Table Set: Ask vs. Auto.

Table.

use auto for now.

Notice symmetry. It doesn't matter whether you use $x = +3$ or $x = -3 \Rightarrow y = 5$.

$y = (x)^2 - 4$

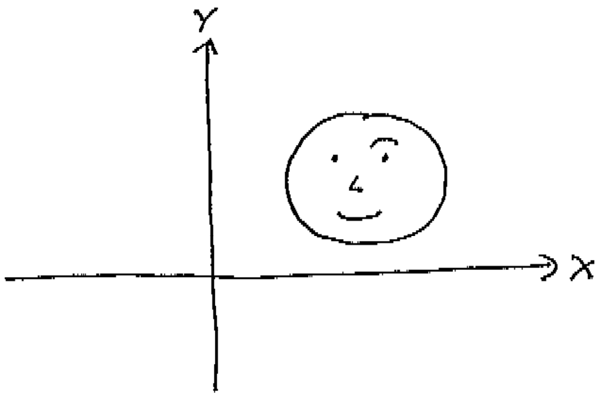
plug in $(-x)$ for (x)

$(-x)^2 - 4 = x^2 - 4 = y$

If you get the samething out regardless of whether you start w/ (x) or $(-x)$, the graph is symmetric about the y-axis. This is called "even."

Graph $y1 = x^2 - 4$.

Symmetry



Examples

$y = |x|$ $\quad$ $y = x$

$y = |x-1|$ $\quad$ $y = x^2$

$y = x$ $\quad$ $y = x^3$

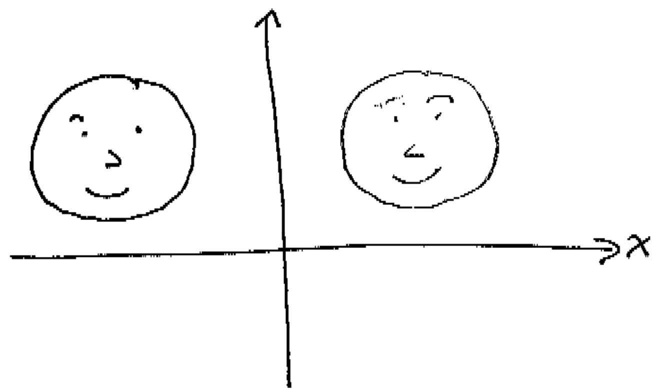
$$y^2 = x.$$

Even

w/respect to the y-axis.

Test. Same w/(x) and (-x)

"EVEN."

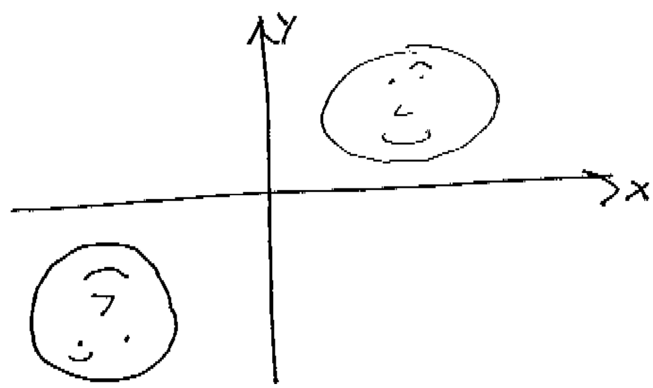


ODD

w/respect to the ~~x-axis~~ origin

Test. $(-x) \Rightarrow (-y)$

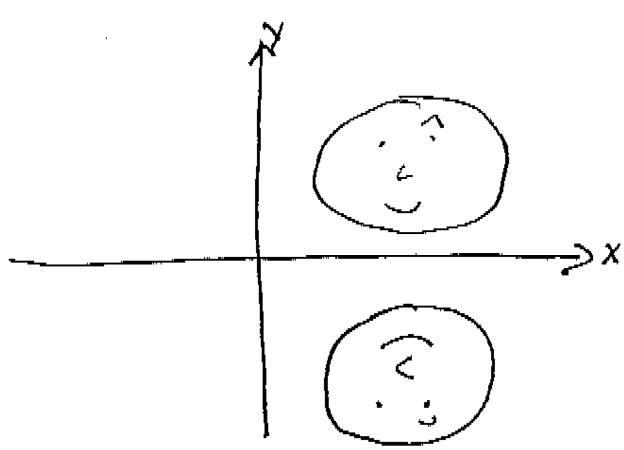
"ODD"



w/respect to the x-axis

Test. $(-y) \Rightarrow (y)$

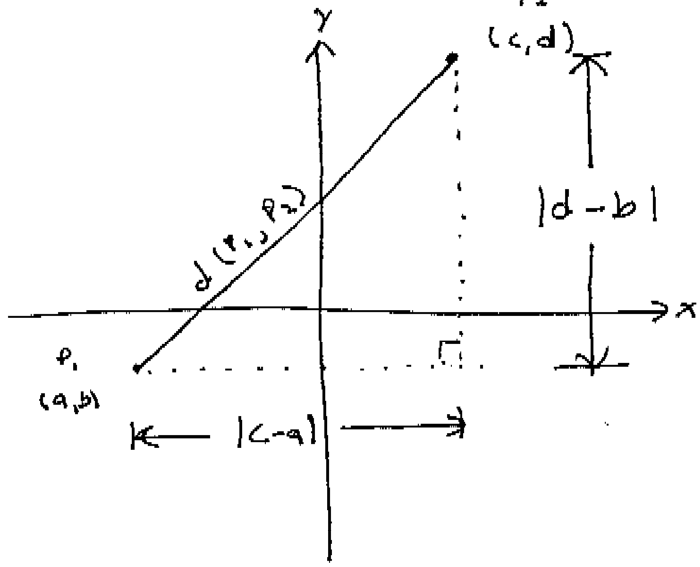
no name



$\boxed{\begin{matrix}2.1b\\1/3\end{matrix}}$

Basic Tools, part 2

Find the distance from $\overbrace{(a,b)}^{P_1}$ to $\overbrace{(c,d)}^{P_2}$.



Pythagorean Theorem for right triangles.

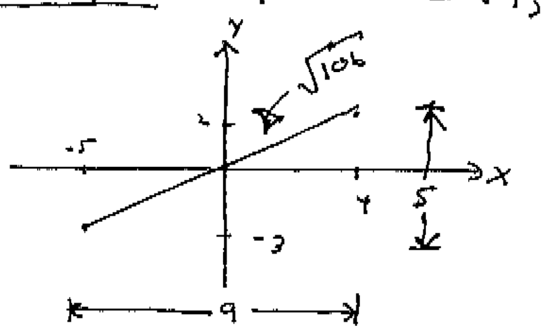
$$A^2 + B^2 = c^2 \Rightarrow c = \oplus\sqrt{A^2+B^2}$$

since a length.

$$d(P_1,P_2) = \sqrt{|c-a|^2 + |d-b|^2}$$

$$= \sqrt{(c-a)^2 + (d-b)^2}$$

<u>Example</u>: Find $d(P_1,P_2)$ if $P_1 = (-5,-3)$ and $P_2 = (4,2)$.



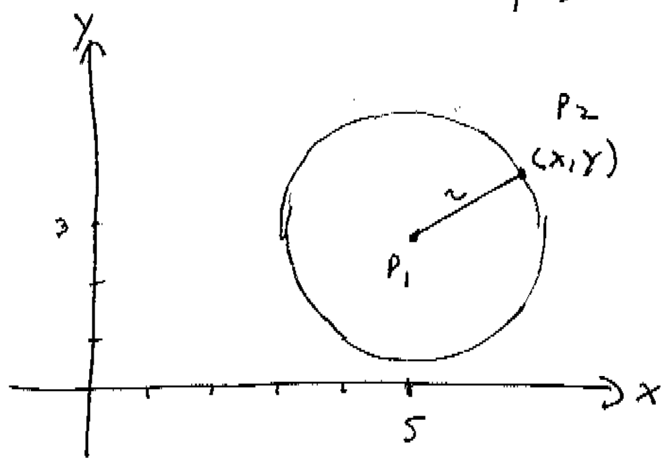
$$d(P_1,P_2) = \sqrt{9^2+5^2}$$

$$= \sqrt{81+25}$$

$$= \sqrt{106}$$

2.1b
2/3

Suppose we have a circle of radius 2 centered at (3,5). Find the equation.



← points on the circle are of the form (x,y)

points (x,y) are a distance of 2 from (5,3).

$$d(P_1,P_2) = \sqrt{(x-5)^2+(y-3)^2}$$

$$\Rightarrow \quad 2 = \sqrt{(x-5)^2+(y-3)^2}$$

$$\Rightarrow \quad \underbrace{2^2 = 4 = (x-5)^2+(y-3)^2}_{\text{circle w/ rad.}=2 \text{ centered at } (5,3).}$$

Generally: A circle w/ rad = r centered at (a,b) has the form

$$(x-a)^2 + (y-b) = r^2$$

$\boxed{\text{Graph}}$ The circle above on the calculator.

→ football

→ window

Find and graph the circle

$$x^2 + y^2 - 2x - 10y = 55$$

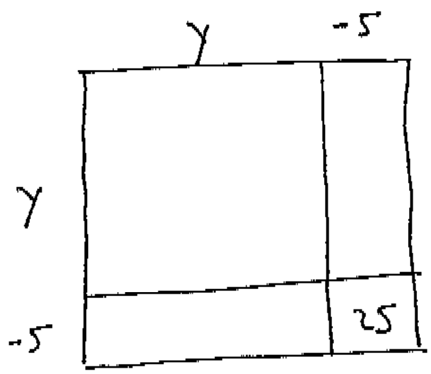
$$\Rightarrow (x^2 - 2x) + (y^2 - 10y) = 55$$

complete the square.

$$\Big(x^2 - 2x + \underbrace{\left(\tfrac{-2}{2}\right)^2}_{1}\Big) + (y^2 - 10y) = 55 + \underbrace{\left(\tfrac{-2}{2}\right)^2}_{1}$$

$$(x-1)^2 + (y^2 - 10y) = 56$$

complete the square



$$(x-1)^2 + (y^2 - 10y + 25) = 56 + 25$$

$$(x-1)^2 + (y-5)^2 = 81$$

circle centered at $(1, 5)$ w/ $r = 9$.