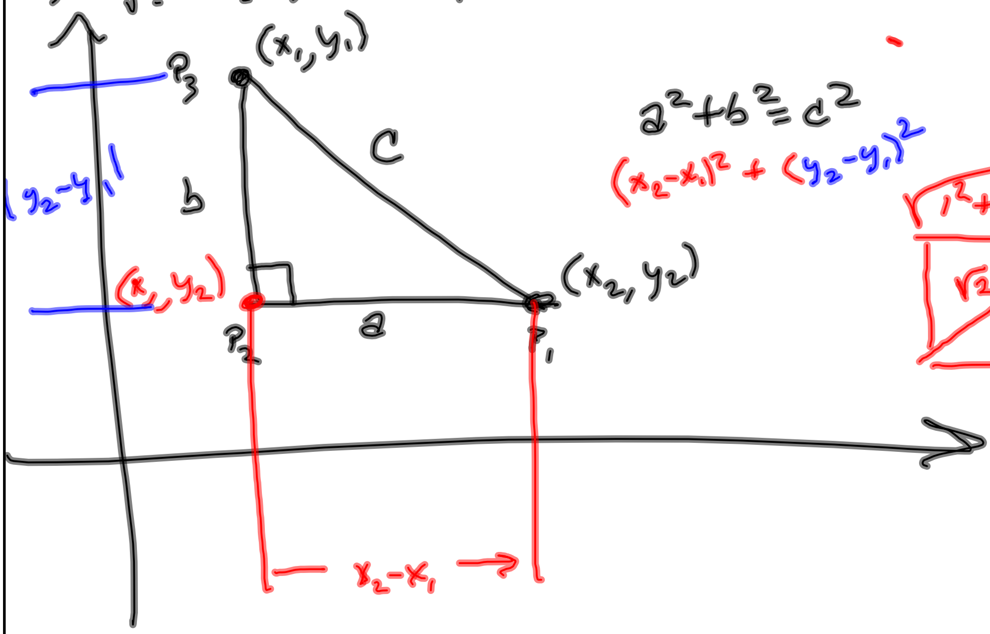
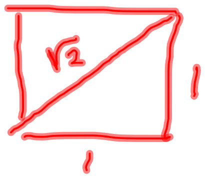
F.1 Distance & Midpoint

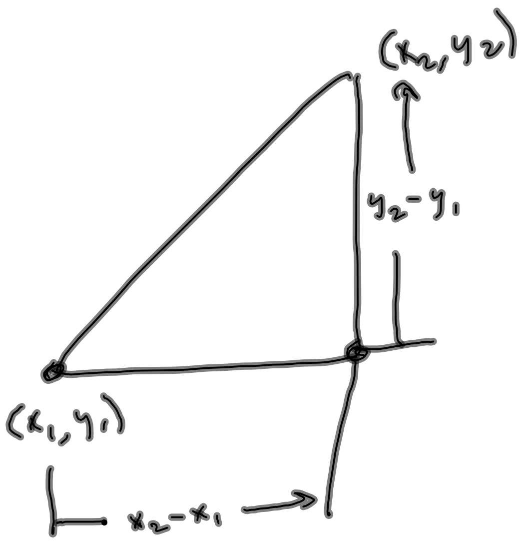


$a^2 + b^2 = c^2$

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

$\sqrt{1^2 + 1^2} = 2$





$a^2 + b^2 = c^2$

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

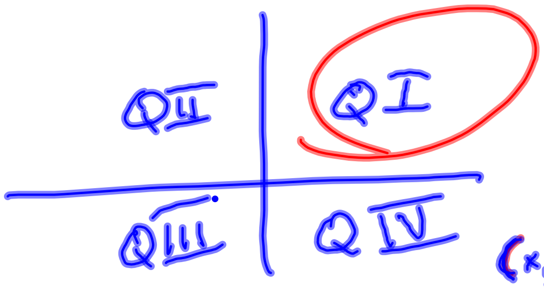
$\sqrt{c^2} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

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

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

Assume distance is positive

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



Distance between $P_1 = \underset{\mathrm{I}}{\overset{(x_1, y_1)}{(2,5)}}$ & $P_2 = \underset{\mathrm{II}}{\overset{(x_2, y_2)}{(-3,2)}}$

$$D(P_1, P_2) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(-3-2)^2 + (2-5)^2}$$

$$= \sqrt{(-5)^2 + (-3)^2}$$

$$= \sqrt{25 + 9}$$

$$= \cancel{\sqrt{25} + \sqrt{9}} \quad \text{No}$$

$$= \cancel{5 + 3} \quad \text{No}$$

$$= 8$$

$\boxed{\sqrt{34} \text{ is as far as you can go.}}$

Sum of square roots is NOT the square root of the sum.

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

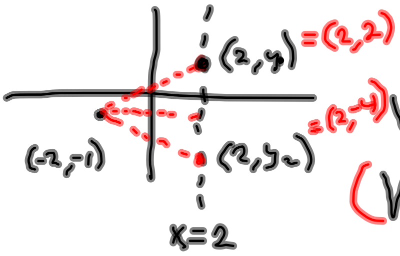
Find all

45 Find all pts whose x-coord. is 2 & whose distance from $\overset{(x_1,y_1)}{(-2,-1)}$ is $D=5$

(x_2,y_2)

Let $(2,y)$ be one of the points.

Need to find y.



$D = 5$

$$\sqrt{(x_1-x_2)^2+(y_1-y_2)^2} = 5$$

$$\left(\sqrt{(-2-2)^2+(-1-y)^2}\right)^2 = 5^2$$

$$(-4)^2 + (-1-y)^2 = 25$$

$$16 + (y+1)^2 = 25$$

$$-16 \qquad = -16$$

$$(y+1)^2 = 9$$

$\sqrt{x^2} = |x|$

$$\sqrt{(y+1)^2} = \sqrt{9}$$

$$|y+1| = 3$$

$$y+1 = \pm\sqrt{9} = \pm 3$$

$$y = -1 \pm 3$$

2   -4

$(-y-1)^2 =$

$(y+1)^2$

$\left((-1)(y+1)\right)^2 =$

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

$= (y+1)^2 =$

y^2+2y+1

$(a+b)^2 = a^2+2ab+b^2$

y1

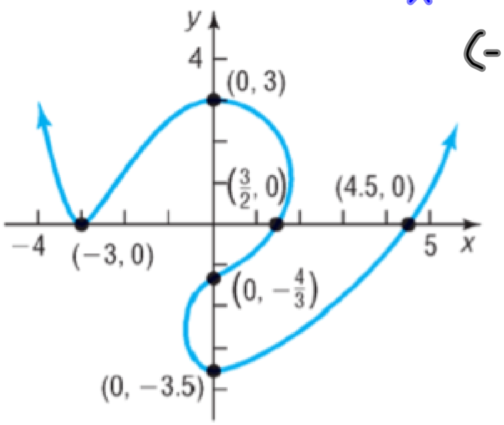
Ans:

$(2,2)$, $(2,-4)$

Finding Intercepts from a Graph

Find the intercepts of the graph.

Not a function. Just some sort of relation.



x-intercepts:

$(-3, 0)$, $(\frac{3}{2}, 0)$, $(4.5, 0)$

y-int:

$(0, 3)$, $(0, -\frac{4}{3})$, $(0, -3.5)$

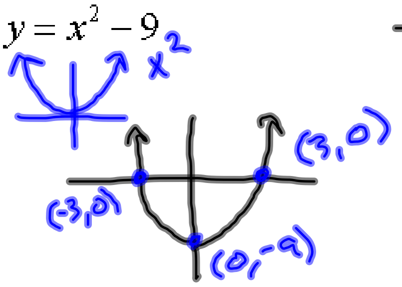
Procedure for Finding Intercepts

1. To find the x-intercept(s), if any, of the graph of an equation, let $y = 0$ in the equation and solve for x.

2. To find the y-intercept(s), if any, of the graph of an equation, let $x = 0$ in the equation and solve for y.

#s 17 - 28: Find the intercepts and graph each equation by plotting points.

$y = x^2 - 9$



y-int.:

$y = 0^2 - 9$

$y = -9$

$(0, -9)$

x-int:

$0 = x^2 - 9$

$x^2 - 9 = 0$

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

$x - 3 = 0$ OR $x + 3 = 0$

$x = 3$ OR $x = -3$

$x^2 = 9$

$x = \pm 3$

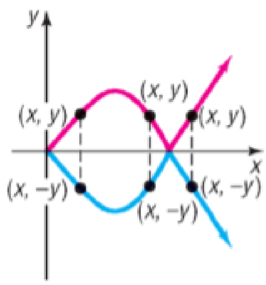
$(-3, 0)$, $(3, 0)$

$y = -x^2 + 1$

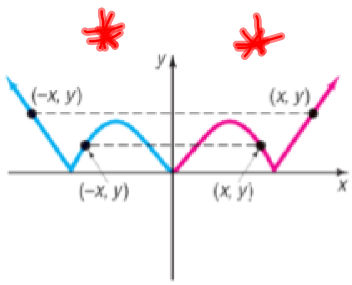
A graph is said to be **symmetric with respect to the *x*-axis** if, for every point (x, y) on the graph, the point $(x, -y)$ is also on the graph. $y=0$

A graph is said to be **symmetric with respect to the *y*-axis** if, for every point (x, y) on the graph, the point $(-x, y)$ is also on the graph.

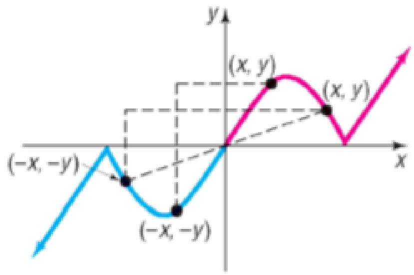
A graph is said to be **symmetric with respect to the origin** if, for every point (x, y) on the graph, the point $(-x, -y)$ is also on the graph.



Symmetry with respect to the *x*-axis



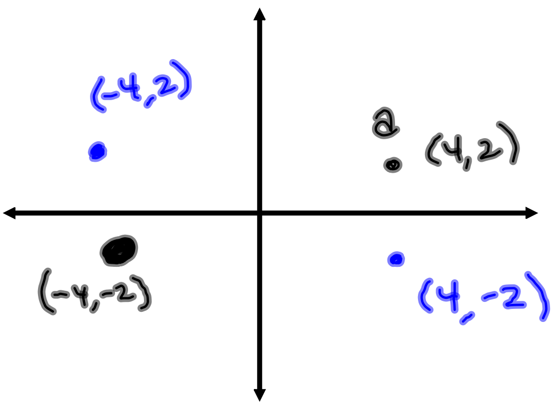
Symmetry with respect to the *y*-axis



Symmetry with respect to the origin

#s 29 - 38: Plot each point. Then plot the point that is symmetric to it with respect to
a - the *x*-axis;
b - the *y*-axis;
c - the origin.

#32. (4, -2)



Tests for Symmetry

To test the graph of an equation for symmetry with respect to the

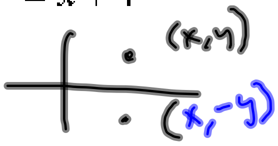
x-Axis Replace y by $-y$ in the equation. If an equivalent equation results, the graph of the equation is symmetric with respect to the x-axis.

y-Axis Replace x by $-x$ in the equation. If an equivalent equation results, the graph of the equation is symmetric with respect to the y-axis.

Origin Replace x by $-x$ and y by $-y$ in the equation. If an equivalent equation results, the graph of the equation is symmetric with respect to the origin.

#s 55 - 70: List the intercepts and test for symmetry.

$y^2 = x + 4$



$y^2 = x+4$

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

$y^2 = x+4$

Yes.

$\boxed{\text{Sym. w.r.t. x-axis}}$

$y^2 = -x+4$ isn't equivalent to $y^2 = x+4$

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

$y^2 = -x+4$ Nope

#s 79 - 82 are cute little quickies.

$y = x^2 - 3x - 4$ is a function

$\therefore$ Not sym. w.r.t. x-axis.

$y = (-x)^2 - 3(-x) - 4$

$y = x^2 + 3x - 4$ Not sym. w.r.t. y-axis.

origin.

$-y = (-x)^2 - 3(-x) - 4$

$-y = x^2 + 3x - 4$

$y = -x^2 - 3x + 4$ Not sym. w.r.t. origin

f(x) is odd, even function comes up

later this semester

sym. w.r.t. y-axis.

sym. w.r.t. origin.

$$y = \frac{-x^3}{x^2-9}$$

x-axis:

$$-y = \frac{-x^3}{x^2-9}$$

$$y = \frac{x^3}{x^2-9} \quad \text{Nope}$$

$$(-x)^3 = -x^3$$

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

y-axis:

$$y = \frac{-(-x)^3}{(-x)^2-9} = \frac{-(-x^3)}{x^2-9} = \frac{x^3}{x^2-9}$$

Not.

Origin:

$$-y = \frac{-(-x)^3}{(-x)^2-9} = \quad -y = \frac{x^3}{x^2-9}$$

$$y = -\frac{x^3}{x^2-9} = \frac{-x^3}{x^2-9} \quad \text{Yes}$$

Symmetric w.r.t. origin

yeppers

$$y = \frac{-x^3}{x^2-9}$$

y-int:

$x = 0 \Rightarrow$

$$y = \frac{-0^3}{0^2-9} = \frac{0}{-9} = 0$$

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

x-int: $y = 0 \Rightarrow$

$$\frac{-x^3}{x^2-9} = 0 \Rightarrow$$

$$-x^3 = 0$$

$$x^3 = 0$$

$$x = 0 \rightsquigarrow (0,0)$$

Only way for a fraction to be zero is if its numerator is zero.

$(x-2)^2+(y+3)^2=9$

$(x-h)^2+(y-k)^2=r^2$ is circle of radius 3 centered @ (h,k)

$\sqrt{(x-2)^2+(y+3)^2}=\sqrt{9}$

$\sqrt{(x-2)^2+(y+3)^2}=3$ is a formula that says all (x,y)-pairs must be $\underline{3}$ from $\underline{(2,-3)}$

$x^2-4x+4+y^2+6y+9=9$

$x^2-4x+y^2+6y=-4$

$(a+b)^2=a^2+2ab+b^2$

$x^2-4x+y^2+6y=-4$

$\frac{4}{2}=2 \rightsquigarrow 2^2$ $\qquad$ $\frac{6}{2}=3 \rightsquigarrow 3^2$

$x^2-4x+2^2+y^2+6y+3^2=-4+2^2+3^2=-4+4+9=9$

$=(x-2)^2+(y+3)^2=9$

Completing the square.