Section P.1 *Graphs and Models*

Ex.1 Find any intercepts: $y = \dfrac{2-\sqrt{x}}{5x+1}$

Find x-intercept: Let $y = 0$

$0 = \dfrac{2-\sqrt{x}}{5x+1}$ $5x+1 \neq 0$

$(5x+1) \cdot 0 = (5x+1)\left(\dfrac{2-\sqrt{x}}{5x+1}\right)$

$\sqrt{x} + 0 = 2 - \sqrt{x} + \sqrt{x}$

$(\sqrt{x})^2 = (2)^2$

$x = 4$

$(4, 0)$

Find y-intercept: $x = 0$

$y = \dfrac{2-\sqrt{0}}{5 \cdot (0) + 1}$

$y = \dfrac{2}{1}$

$y = 2$

$(0, 2)$

Ex.2 Test for symmetry with respect to each axis and the origin: $y = \dfrac{x^2}{x^2+1}$

Let $f(x) = y$

Consider
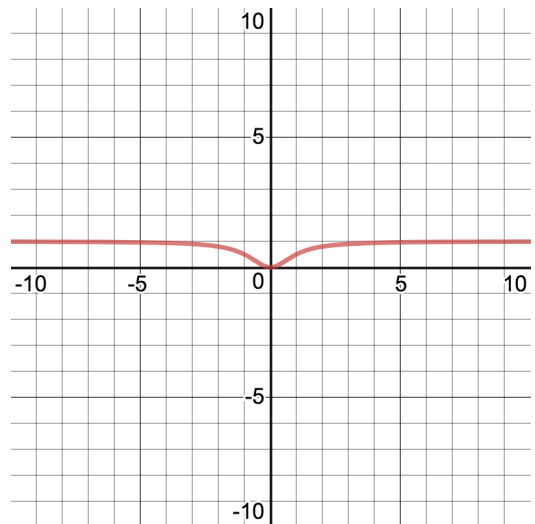
$f(-x) = \dfrac{(-x)^2}{(-x)^2 + 1}$

$f(x) = \dfrac{x^2}{x^2+1}$

$f(-x) = f(x)$

Even function

Symmetric about the y-Axis

Elimination
"Get rid of y's"

Ex.3 Find the points of intersection:
$$\begin{cases} 3x - 2y = -4 \\ 4x + 2y = -10 \end{cases}$$

$3x - 2y = -4$
$+\ 4x + 2y = -10$
_____
$7x = -14$

$\dfrac{7x}{7} = \dfrac{-14}{7}$

$x = -2$

Point is $(-2, -1)$:

Find y! use substitution

$4x + 2y = -10$
$4(-2) + 2y = -10$
$-8 + 2y = -10$
$-8 + 2y + 8 = -10 + 8$
$\dfrac{2y}{2} = \dfrac{-2}{2}$
$y = -1$

$3(-2) - 2(-1) = -4$
$-6 + 2 = -4$
$-4 = -4$
TRUE!

$4(-2) + 2(-1) = -10$
$-8 - 2 = -10$
$-10 = -10$
TRUE!

$3x - 2y = -4$
$\dfrac{3x + 4 = 2y}{2} \quad \dfrac{}{2}$
$\boxed{y = \tfrac{3}{2}x + 2}$
y_1

$4x + 2y = -10$
$\dfrac{2y}{2} = \dfrac{-4x - 10}{2}$
$\boxed{y = -2x - 5}$
y_2
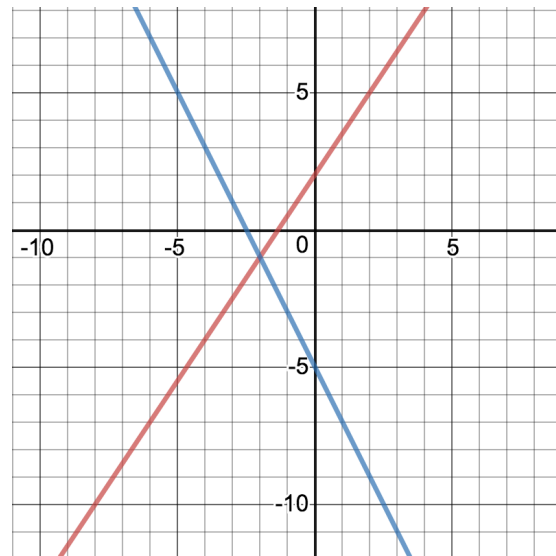
Ex.4 Find the points of intersection: $\begin{cases} x^2 + y^2 = 25 \\ -3x + y = 15 \end{cases}$
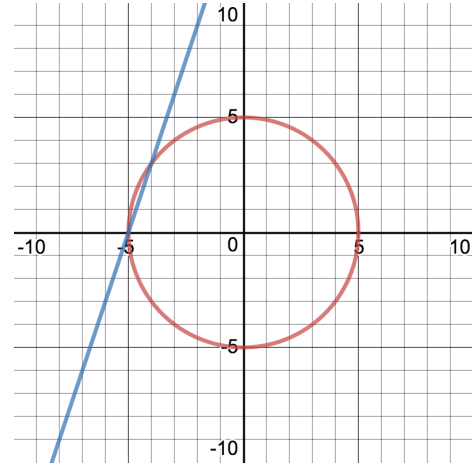
Solve by substitution.

Solve for y: $-3x + y = 15$

$\qquad\qquad -3x + y + 3x = 3x + 15$ SDWK

$\qquad\qquad \boxed{y = 3x + 15}$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (3x + 15)^2$

In $x^2 + y^2 = 25$, replace y. $= (3x + 15)(3x + 15)$

$x^2 + (3x + 15)^2 = 25$ $= 9x^2 + 45x + 45x + 225$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad = 9x^2 + 90x + 225$

$x^2 + 9x^2 + 90x + 225 = 25$

$10x^2 + 90x + 225 - 25 = 25 - 25$

$10x^2 + 90x + 200 = 0$

$\frac{1}{10}(10x^2 + 90x + 200) = \frac{1}{10} \cdot 0$

$x^2 + 9x + 20 = 0$

$(x + 4)(x + 5) = 0$

Either

$x + 4 = 0$, or $x + 5 = 0$

$\underline{x = -4}$, or $\underline{x = -5}$

check: $(-4, 3)$

$(-4)^2 + (3)^2 = 25$

$16 + 9 = 25$

$25 = 25$ ✓

$-3(-4) + (3) = 15$

$12 + 3 = 15$

$15 = 15$ ✓

check! $(-5, 0)$

$(-5)^2 + (0)^2 = 25$

$25 = 25$ ✓

$-3(-5) + (0) = 15$

$15 = 15$ ✓

Find y: use $y = 3x + 15$

If $x = -4$

$y = 3(-4) + 15$

$y = -12 + 15$

$y = 3$

If $x = -5$

$y = 3(-5) + 15$

$y = -15 + 15$

$y = 0$

The solution set is

$\{(-4, 3), (-5, 0)\}.$