$\sqrt{\ }$ function

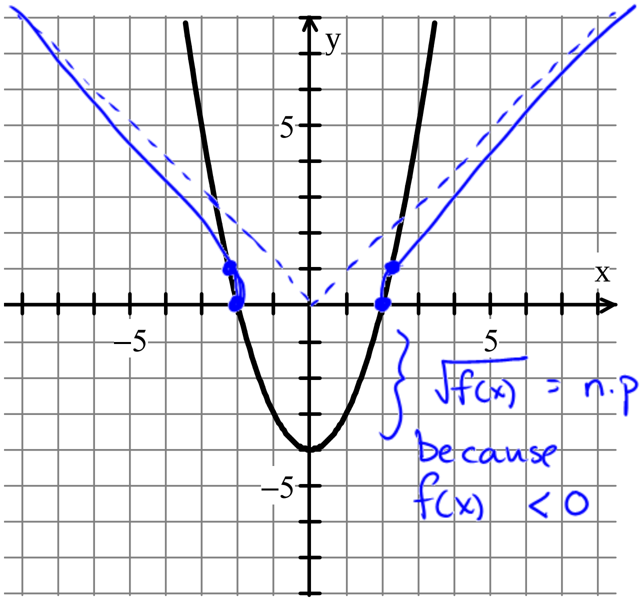
1) invariant points.
$y = 1$ or $y = 0$

2) diagonal asymptotes / end behaviour

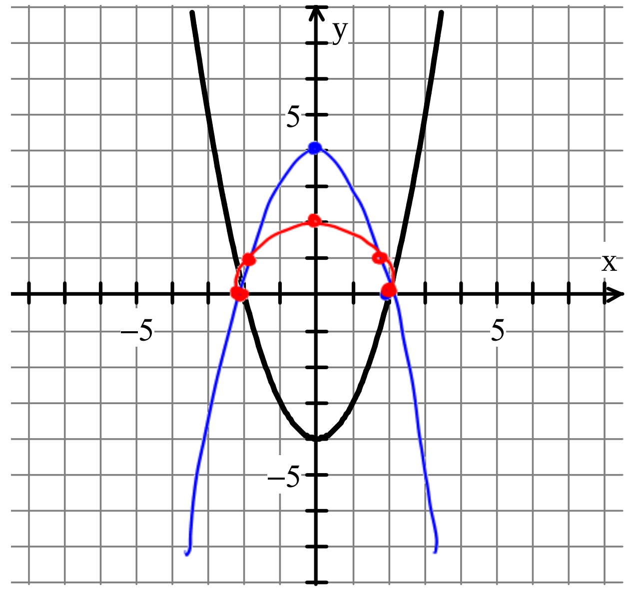
Warm-Up 2.3

Given the function $f(x) = x^2 - 4$, sketch each of the following:

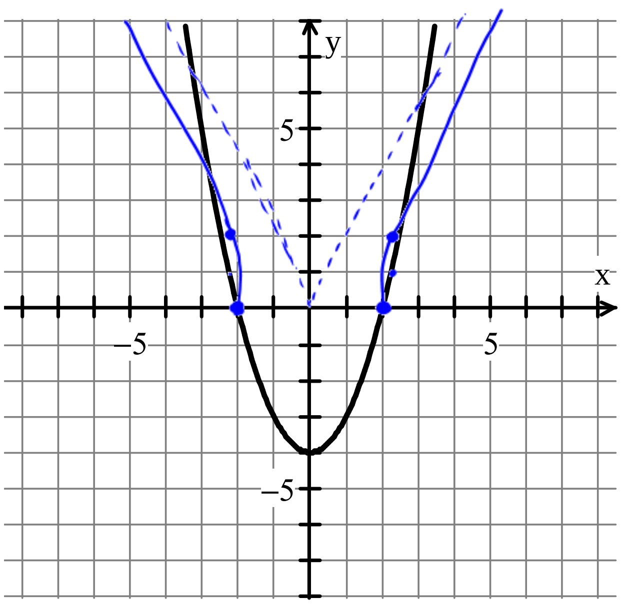
a) $y = \sqrt{f(x)}$ $\quad y = \sqrt{x^2 - 4}$



b) $y = \sqrt{-f(x)}$ $\quad y = -f(x)$

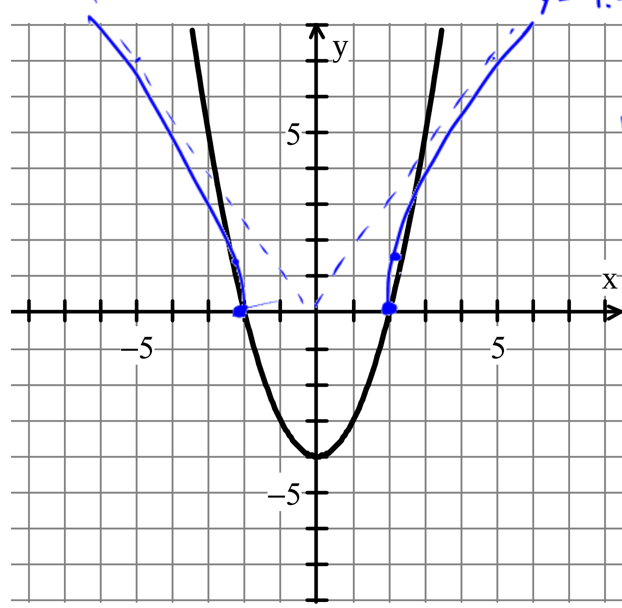


c) $y = 2\sqrt{f(x)}$ $\quad y = 2\sqrt{x^2 - 4}$



d) $y = \sqrt{2f(x)}$ $\quad y = \sqrt{2}\sqrt{f(x)}$

$y = 1.4\sqrt{x^2 - 4}$



$1.4 \approx \frac{7}{5}$

$y = \frac{7}{5}x$

2.3 Solving Radical Equations Graphically

As with other equations that we have solved in the past, radical equations can be solved both algebraically and graphically. Both methods have their advantages and disadvantages. For example, algebraic solutions will include extraneous roots, whereas graphical solutions will not. That being said, an algebraic solution is generally more accurate than one derived from a drawn graph.

Example 1:

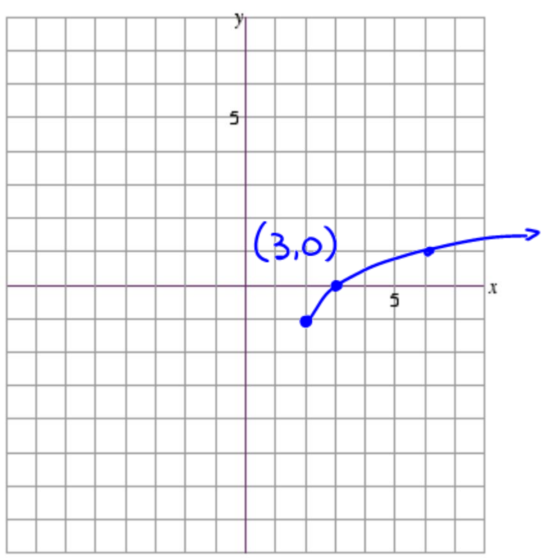
a) Determine the root(s) of $\sqrt{x-2}-1=0$ algebraically.

$$\sqrt{x-2}-1=0$$
$$\sqrt{x-2}=1$$
$$x-2=1$$
$$x=3$$

check for extraneous roots by substitution

$$\sqrt{3-2}-1=0$$

b) Using a graph, determine the x-intercept(s) of the graph ~~of graph~~ of $y=\sqrt{x-2}-1$.



2nd calc zero

What's the difference between a zero of a function and the root of an equation?

zero of a function asks you to find the x-value that makes output 0.

roots of an equation are the values of x that make the equation true.

Example 2:

Solve the equation $\sqrt{x+5} = x+3$ both algebraically and graphically.

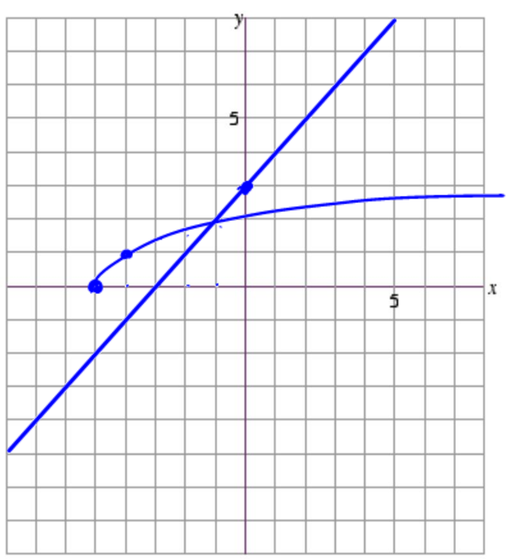
Algebraically:

$$\sqrt{x+5} = x+3$$
$$x+5 = (x+3)^2$$
$$x+5 = x^2+6x+9$$
$$0 = x^2+5x+4$$
$$0 = (x+4)(x+1)$$
$$x = -1 \text{ or } -4$$

check $x=-1$
$$\sqrt{-1+5} = -1+3$$
$$\sqrt{4} = 2 \quad \checkmark$$

check ~~$x=-4$~~
$$\sqrt{-4+5} = -4+3$$
$$\sqrt{1} = -1 \quad \text{extraneous}$$
reject $x=-4$

Graphically:



$$\underbrace{\sqrt{x+5}}_{Y_1} = \underbrace{x+3}_{Y_2}$$

2nd calc intersect

$(-1, 2)$

$$\boxed{x=-1}$$

Example 3:

initial v acceleration

final v size of drop

An engineer designs a roller coaster that has a steep vertical drop. He uses the equation $v=\sqrt{(v_0)^2+2ad}$ to model the velocity, v, in feet per second of the ride's cars after dropping a distance, d, in feet, with an initial velocity, v_0, in feet per second, at the top of the drop, and constant acceleration, a, in feet per second squared. The design specifies that the speed of the ride's cars be at 100 ft/s at the bottom of the vertical drop. If the initial velocity of the coaster at the top of the drop is 8 ft/s and the only acceleration is due to gravity, 32 ft/s^2, what vertical drop distance should be used, to the nearest foot?

a) Substitute the known values into the formula.

$$100=\sqrt{(8)^2+2(32)d}$$

note: you could also make one side = 0 and find x-intercepts

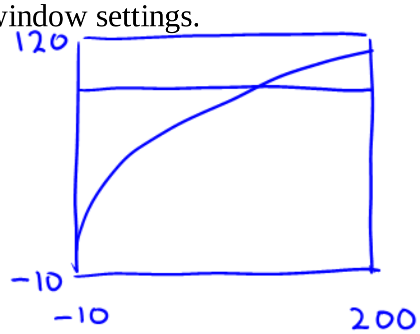
$$0=\sqrt{8^2-2(32)d}-100$$

b) Using the equation from 'a', what two functions would you graph to solve the problem?

$Y_1=100$

$Y_2=\sqrt{64+64d}$

c) Determine the solution to the problem graphically. Supply a sketch of the graph used with appropriate window settings.



2nd calc intersect

$x=155.25$

$\boxed{\text{The vertical drop is 155.25 ft}}$

p 96 #1-7, 9, 10, 13, 16 *14, 17.

Test: Thursday. Oct 17.