WARM UP! On a clean sheet of paper.

Solve the polynomial: $x^3 - 2x^2 - 11x + 29 = 5x - 3$

$-5x+3 \quad -5x+3$

$x^3 - 2x^2 - 16x + 32 = 0$

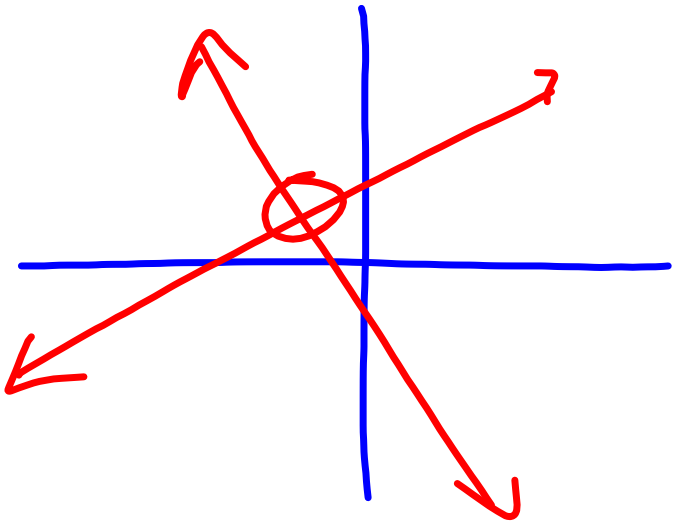
$x^2(x-2) - 16(x-2) = 0$

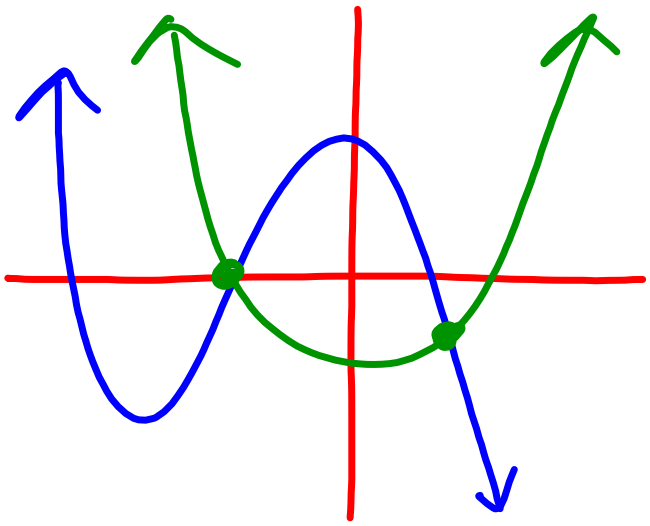
$(x-2)(x^2-16) = 0$

D.O.T.S.

F.F. $(x-2)(x+4)(x-4) = 0$

$x = 2, \pm 4$





Solving Systems with Polynomial & Linear Functions

Essential Question: How do you solve a system of equations involving polynomials?

MCC9-12.A.REI.11 Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear polynomial, rational, absolute value, exponential, and logarithmic functions.★

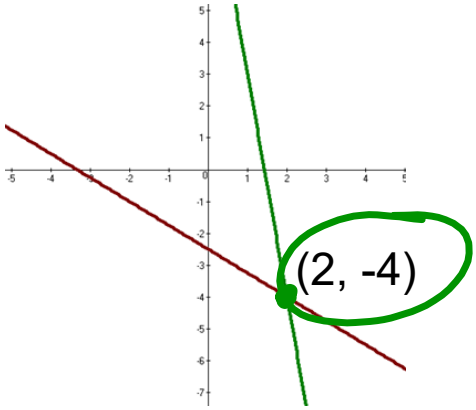
MCC9-12.A.REI.7 Solve a simple system consisting of a linear equation and a quadratic polynomial equation in two variables algebraically and graphically.

Solving Systems with Polynomial & Linear Functions

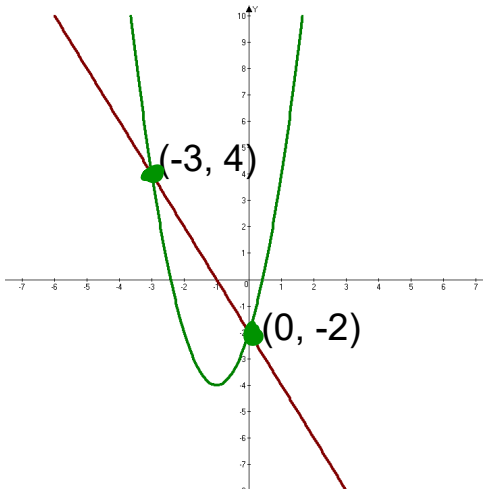
KEY IDEAS

- The solution(s) to ANY systems of equations is the point(s) of intersection(s) of the 2 or more functions! Each point of intersection is a solution to the system.

Solve $\begin{cases} f(x) = -\frac{3}{4}x - \frac{5}{2} \\ g(x) = -7x + 10 \end{cases}$



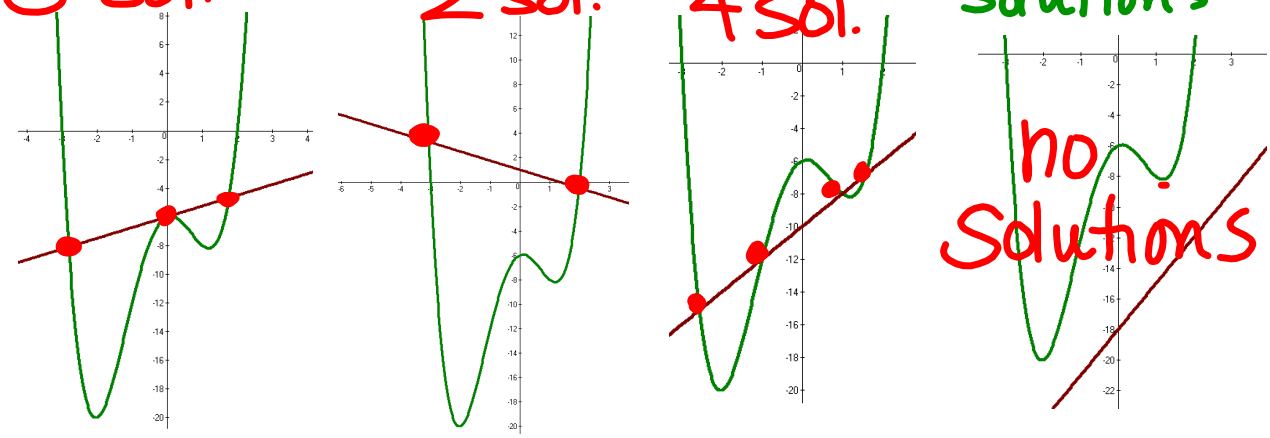
Solve $\begin{cases} f(x) = 2x^2 + 4x - 2 \\ g(x) = -2x - 2 \end{cases}$



- Depending on the functions and how many times they cross determines the amount of solutions that are possible. The highest degree of the polynomial is the highest # of *possible solutions*. Sometimes there are no solutions.

$f(x) = (x+3)(x-2)(x^2+1)$ deg: 4

$g(x) = mx+b$



Solve the system: $f(x) = x^3 - 2x^2 - 11x + 29$ $= y_1$

$g(x) = 5x - 3$ $= y_2$

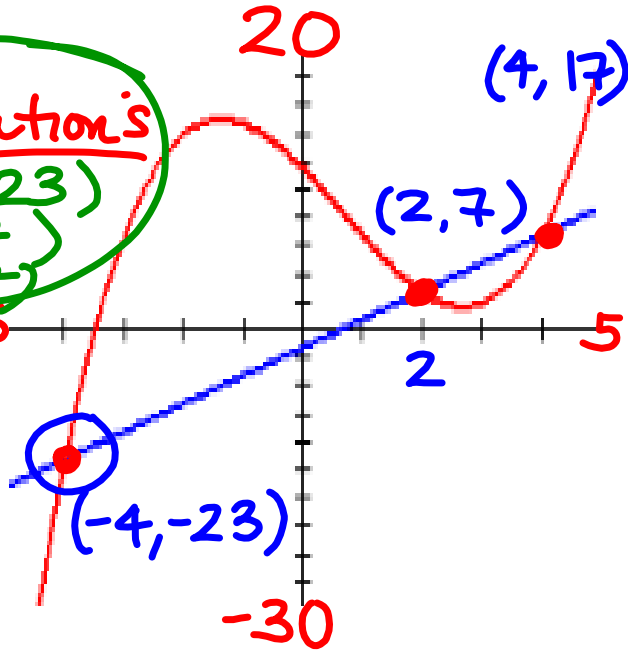
Graphing calculator:

Calculate the points of **intersections**

Table

X	y_1	y_2
-4	-23	-23
2	7	7
4	17	17

3 solutions
(-4, -23)
(2, 7)
(4, 17)



Solve Systems Algebraically:

1. Set the two functions equal to each other and solve for x.

2. Substitute each x value into one of the functions to get the y value.

3. Write final answers as ordered pairs.

4. Check in OTHER function not used in step 2!

Solve the system algebraically:

use tables $f(21) = 8177$

$f(x) = x^3 - 2x^2 - 11x + 29$

$g(x) = 5x - 3$

From Warm-up!

F.F. $(x-4)(x+4)(x-2) = 0$

$x = 4, -4, 2$

plug x-values into g(x) to get y-values

$(4, 17)\ (-4, -23)\ (2, 7)$

When solving any equation, you can set each side equal to f(x) and find their intersection. The "x" value of the point of intersection is the solution to the equation.

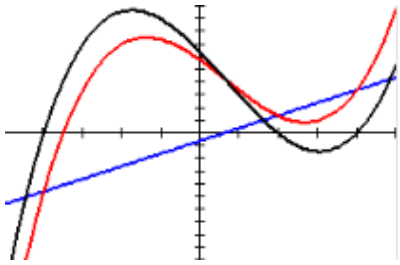
$$x^3 - 2x^2 - 11x + 29 = 5x - 3$$

$$-5x + 3 \quad -5x + 3$$

If you have a system of equations you can solve for "y" and then set two of them equal to each other & solve.

$$\begin{cases} y_1 = 5x - 3 \\ y_2 = x^3 - 2x^2 - 11x + 29 \end{cases}$$

$$y_3 = x^3 - 2x^2 - 16x + 32 = 0$$



X	Y1	Y2	Y3
-6	-33	-193	-160
-5	-28	-91	-63
-4	-23	-23	0
-3	-18	17	35
-2	-13	35	48
-1	-8	37	45
0	-3	29	32
1	2	17	15
2	7	7	0
3	12	5	-7
4	17	17	0

Table: Can you ID x-intercepts, y-intercepts, &/or solutions for the systems?

Solve Algebraically

1. Find the points of intersection between

$f(x) = -2x - 2$ and $g(x) = -2x^3 + x^2 - 3$

1) Set equal

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

$+2x+2 \qquad +2 \qquad +2x$

2) Set equal to Zero and Solve

$0 = -2x^3+x^2+2x-1$

$(2x^3 - x^2 - 2x + 1) = 0$

$(2x-1)(x^2-1) = 0$

$(2x-1)(x+1)(x-1) = 0$

$x = \frac{1}{2}$ $f(\frac{1}{2}) = -3$

$x = -1$ $f(-1) = 0$

$x = 1$ $f(1) = -4$

$(\frac{1}{2}, -3)$

$(-1, 0)$

$(1, -4)$

2. Solve the system algebraically

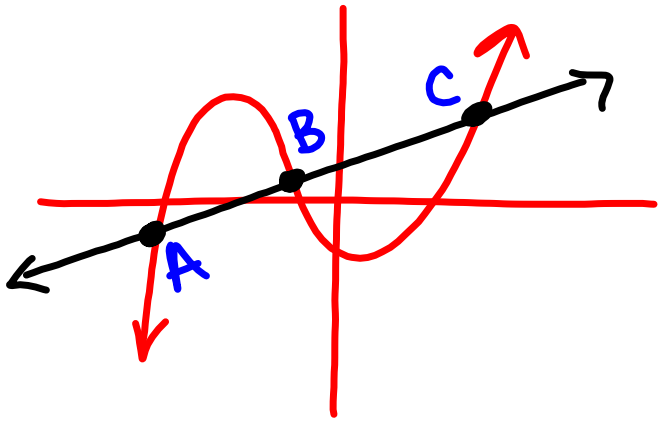
$$\begin{cases} f(x) = 3x^2 + 5x - 6 \\ g(x) = -2x \end{cases}$$

Graphical Solutions

Could be 3

3. Find the points of intersection between

$f(x) = 2x + 4$ and $g(x) = x^3 + 4x^2 - 3$



A (-4.07, -4.14)

B (-1.28, 1.44)

C (1.35, 6.69)

4. Solve the system graphically

$$\begin{cases} f(x) = 4x + 3 \\ g(x) = x^4 - 8x^2 - 6 \end{cases}$$

Word Problems!

Alg 2 Book TE p. 361

1. A company that makes soup wants to change the size of it cylindrical soup cans. The radius of the new can will be 5 cm less than the height. The container will hold 144π cm^3 of salsa. What are the dimensions of the new container?

Alg 2 book p. 363 #59

2. From 1990 to 1994, the mail order sales of health products in the USA can be modeled by

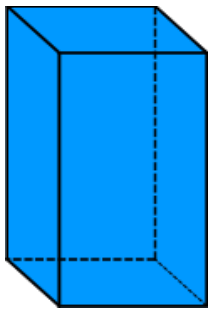
$$S = 10t^3 + 115t^2 + 25t + 2505$$

where S is the sales (in millions of dollars) and t is the # of years since 1990. In what year were about $3885 million of health products sold?

Alg 2 book p. 363 #61

3. At a factory, molten glass is poured into molds to make paperweights. Each mold is a rectangular prism whose height is 3 inches greater than the length of each side of the square base. A machine pours 20 cubic inches of liquid glass into each mold.

A) What is the polynomial function that represents the volume of each paperweight?



B) What are the dimensions of the mold?