

7.4 Solving Equations and Inequalities Jan 9th

Method 1: "Guess and Test" to Solve an Equation

- use when an algebraic solution is not possible
- rearrange the equation so one side equals zero
- estimate a value that will be a zero and test it in the equation
- refine the estimate to get a value closer to zero
- repeat...repeat...repeat..... to indicated degree of accuracy

Example 1:

Use a guess and test strategy to solve to the nearest tenth in the given interval.

a) $2\cos x = 5x^2 - 7x - 3$, $0 \leq x \leq 4$

x	y
0	5
1	6.08
-1	-7.9
-0.5	0.005
2	-3.82
1.6	1.34
1.8	-1.25

oops!

$$2\cos x - 5x^2 + 7x + 3 = 0$$

$$x \doteq 1.7$$

closest to zero that fits our restrictions!

b) $\frac{x}{x-4} = 3 \log x$, $x \in (4, 8]$

$$4 < x \leq 8$$

x	y
5	2.9
6	0.67
7	-0.2
6.7	0.003
6.8	0.069
6.6	0.097

$$\frac{x}{x-4} - 3 \log x = 0$$

$$x \doteq 6.7$$

Method 2: Using Graphing Technology to Solve an Equation

Option A:

Graph the LS and RS as separate equations and determine their point of intersection.

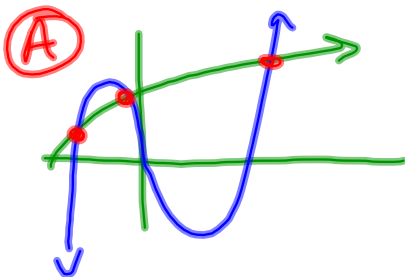
OR

Option B:

Rearrange the equation so one side equals zero and determine the zeros.

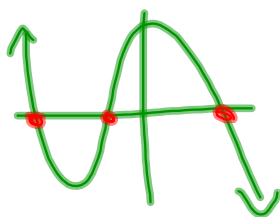
Example 2: Solve using graphing technology.

a) $\sqrt{x+8} = x^3 - 7x$



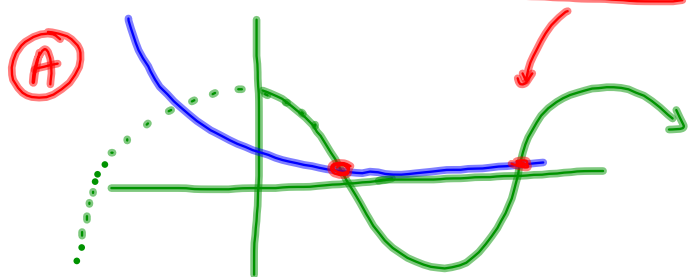
$x = 2.5, -0.4, 2.9$

(B) $\sqrt{x+8} - x^3 + 7x = 0$



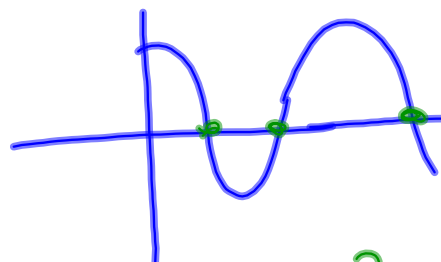
$x = -2.5, -0.4, 2.9$

b) $3\cos x = (\frac{1}{2})^x, 0 \leq x \leq 6$



~~$x = -0.9$~~ , 1.4, 4.7
 ↑
 not in domain

(B) $3\cos x - \frac{1}{2}^x = 0$



$x = \{1.4, 4.7\}$

Method 3: Using Graphing Technology to Solve an Inequality

Option A:

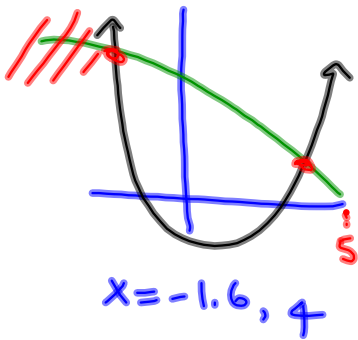
Graph the LS and RS as 2 different functions and determine the intervals in OR which one is above/below the other.
(need pt. of intersection)

Option B:

Rewrite as a single function and determine the intervals in which the function is above/below the x-axis.
(need zeros)

Example 3: Solve using graphing technology.

(A) $4 \log(5-x) \leq x^2 - 3x - 4$



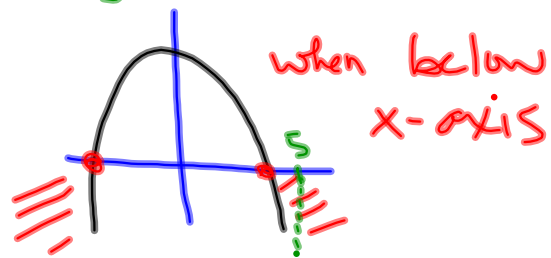
$$x \leq -1.6, 4 \leq x < 5$$

↑
watch restrictions!

$$\begin{aligned} 5-x > 0 \\ -x > -5 \\ x < 5 \end{aligned}$$

hint: watch the restriction on x

$$4 \log(5-x) - x^2 + 3x + 4 \leq 0$$



$$x \leq -1.6, 4 \leq x < 5$$

a little

And NOW for something ~~completely~~ different:

Example 4: Solve algebraically.

$$\frac{54\,000 (0.84)^x}{54\,000} = \frac{43\,000 (0.92)^x}{54\,000}$$

$$\frac{0.84^x}{0.92^x} = \frac{\left(\frac{43}{54}\right) (0.92)^x}{0.92^x}$$

$$\left(\frac{0.84}{0.92}\right)^x = \frac{43}{54}$$

* Now that the power is isolated, you can take the log of both sides!

$$\log\left(\frac{0.84}{0.92}\right)^x = \log\left(\frac{43}{54}\right)$$

$$x = \frac{\log\left(\frac{43}{54}\right)}{\log\left(\frac{0.84}{0.92}\right)}$$

$$\approx 2.5$$

Homework

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#3,6,9 ...need G.C.

#1,2,4,5,8 without G.C.

