# Solving Equations Using Intersection 2 MathPrint View

## Objectives:

- Recall the steps in the Intersection method
- Find approximate solutions
- Observe the graphs when there is no solution
- Find answers when there are two solutions

## **Recall the steps in the Intersection method**

**Step 1:** Graph  $y_1 = LHS$  and  $y_2 = RHS$  for the equation and observe the point of intersection.

Step 2: If the point of intersection is not visible, adjust the window until the x-coordinate is in the window.
Step 3: Use the Intersect calculation, in the CALC menu, which is .2<sup>nd</sup> TRACE.

**IMPORTANT:** This calculation has **four** steps:

Step **3a:** Select option 5, intersect, from the CALC menu.

Step **3b:** See  $y_1$  in the upper left corner of the screen and press ENTER to select  $y_1$  as "1st curve".

Step **3c:** See  $y_2$  in the upper left corner of the screen and press ENTER to select  $y_2$  as "2nd curve".

Step **3d**: Use left or right arrows to move the cursor near intersection and press ENTER for "Guess". **Step 4**: The solution is the x-coordinate ONLY.

## Find approximate solutions

**WARNING:** Don't use "Trace" to find the intersection. It may get close, but often has nasty decimals. **CAUTION:** If you round the answer, you have found an approximate solution. This is also called "approximating the solution". Re-read the instructions to see a) if rounding is okay, and b) how to round.

<b>Example 1:</b> Use a graphing calculator to find the solution to $\pi x - \sqrt{2} = 7$ . Round to the solution to $\pi x - \sqrt{2} = 7$ .	ie nearest tenth.
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**Step 2:** The point of intersection is visible, so don't adjust the window.





**Step 4:** The solution is the x-coordinate ONLY, and the instructions said to round. Answer:  $x \approx 2.7$ 

#### Observe the graphs when there is no solution

**Example 2:** Solve 3x - 7 = 3x + 2 a) algebraically and b) graphically.

a) Subtract from both sides gives -7 = 2, a false statement, or contradiction, giving answer: <u>No solution</u>.



Notice what might be parallel lines and look again at the equation.

The two expressions are lines with the same slope but different y-intercepts, making them parallel. Parallel lines do not intersect. If the graphs do not intersect, the answer is <u>No solution</u>.

**EXPLORATION:** But what will the calculator do if we try to calculate the point of intersection?



This error usually means that there is no solution.

But, if there are two solution, it might mean your cursor for "Guess?" was too far from a solution.

#### Find answers when there are two solutions

**NOTE:** If there are two (or more) points of intersection, use the same method twice (or more): once for each solution.

**IMPORTANT:** You must choose the "Guess?" more carefully or you'll get the same answer repeatedly.

**Example 3:** Use a graphing calculator to find the solutions to  $9 - x^2 = 7$ . Round to the nearest thousandth.

#### Step 1: Graph



Step 2: Both points of intersection are visible.

<u>Step 3:</u> Calculate the first point of intersection:



Move the cursor closer to the intersection on the left by pressing:





Solution:  $x \approx -1.414$ 

<u>Repeat Step 3</u>: Calculate the second point of intersection:



Move the cursor closer to the intersection on the right:



**Bonus:** If you know how, solve the equation in the last example and double-check these answers.

### Try It!

- 1) Solve the equation -2x + 6 = -2x 4 graphically.
- 2) Solve  $2x \pi = 4 x$  graphically. Round to the nearest hundredth.
- 3) Solve  $5 + x^2 = 8$  graphically. Round to the nearest hundredth.
- 4) Solve  $5 x^2 = 7$  graphically.

## **Solutions**



The graphs do not intersect. Answer: no solution