

# Where 2 functions meet (or do not meet)

Homework:

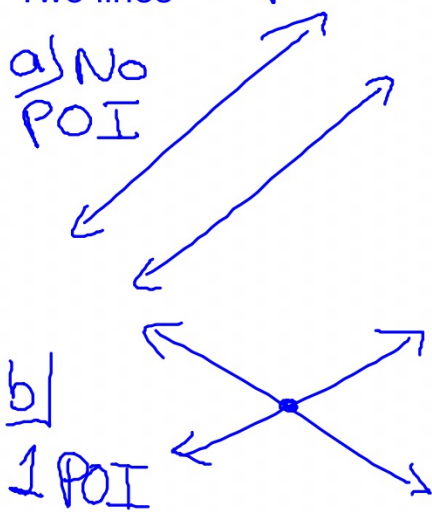
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Points of Intersection (= POI)

at 2 points

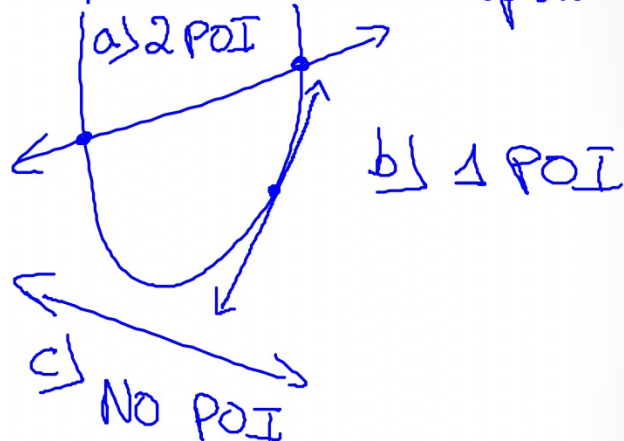
## Intersect, not intersect & touch

Two lines: 2 options

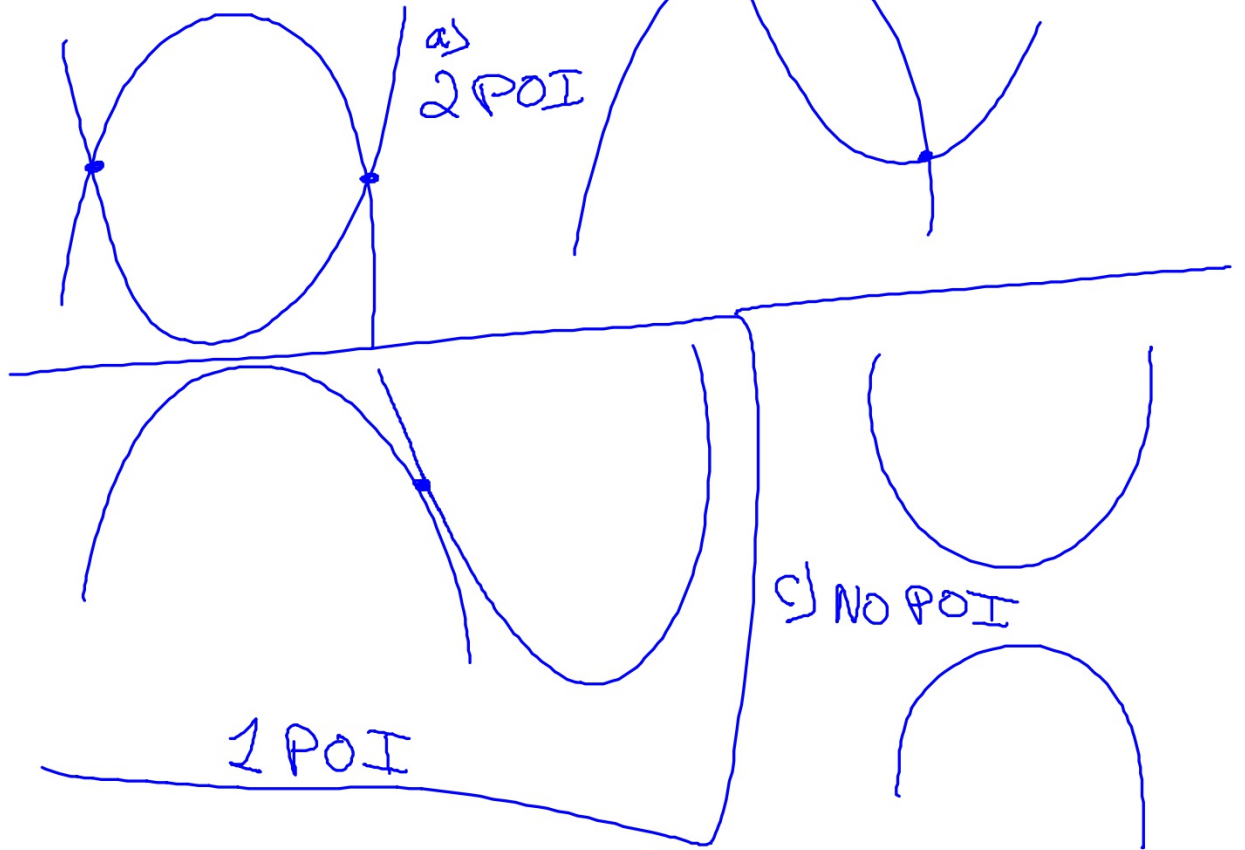


one point

A parabola and a line: 3 options

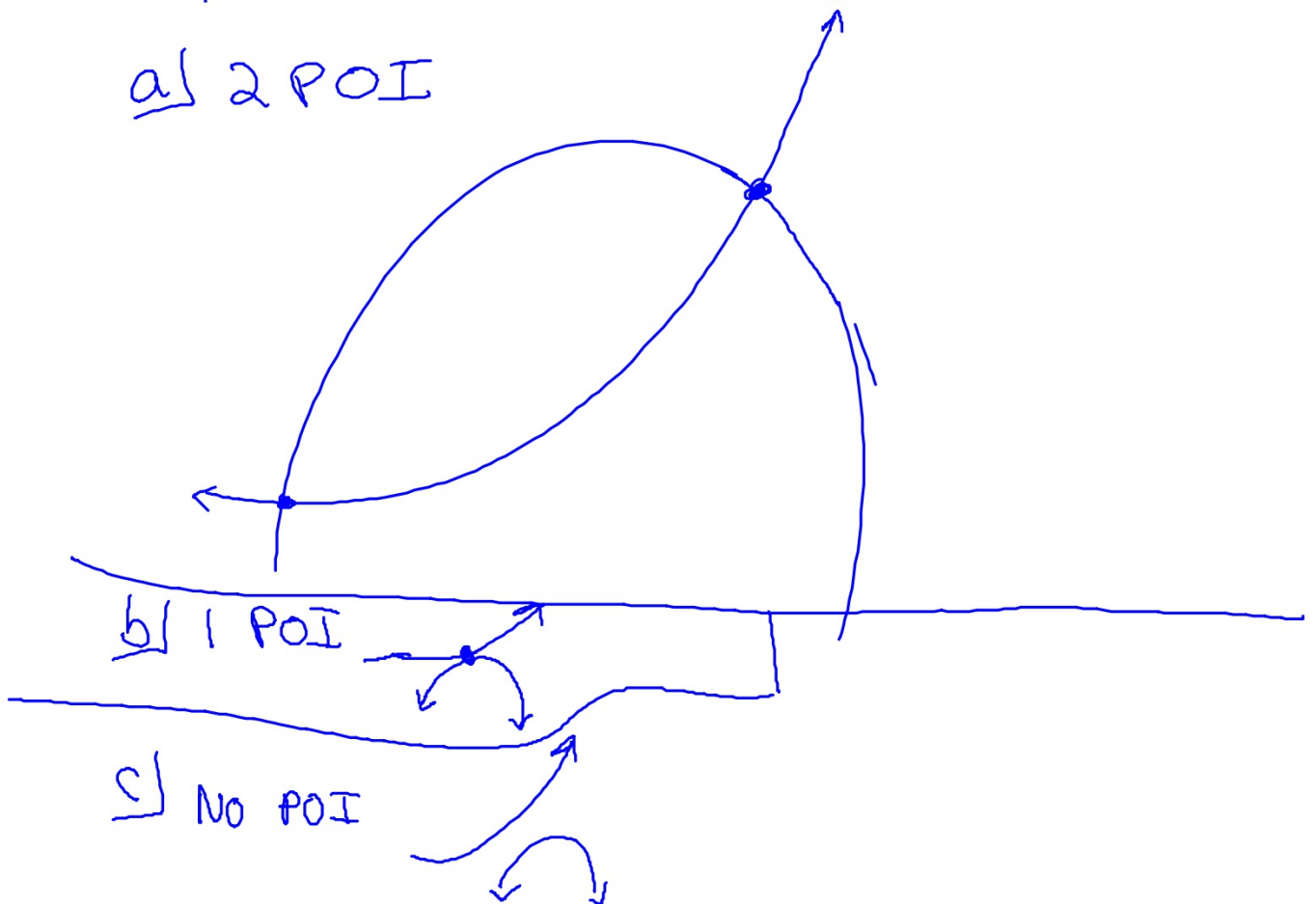


Two parabolas: 3 options



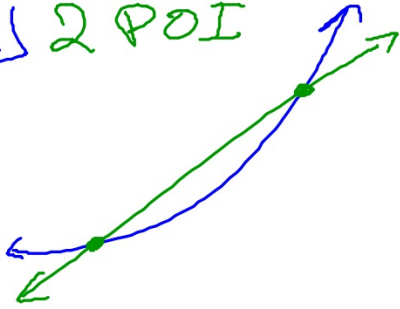
Exponential Function and Parabola: 3 options

a) 2 POI

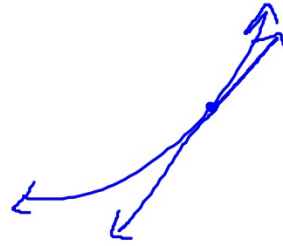
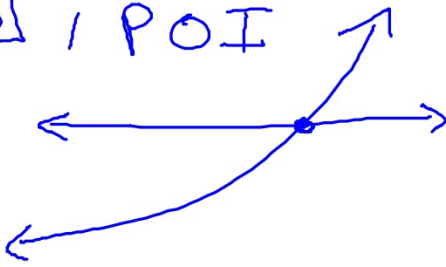


Exponential Function and Line: 3 options

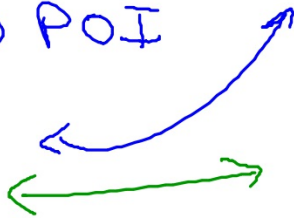
a) 2 POI



b) 1 POI

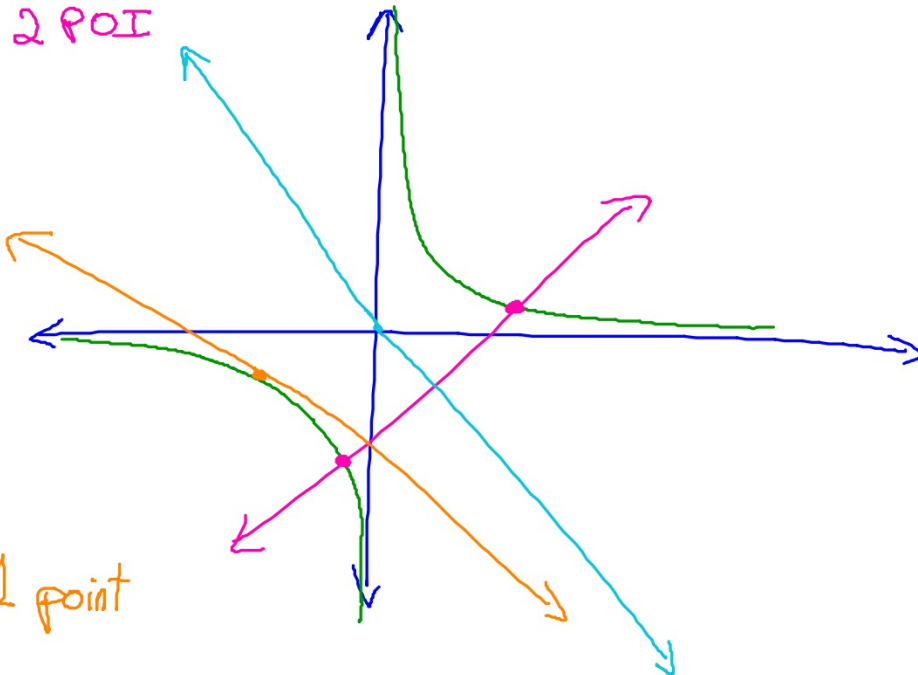


c) NO POI



Line and Reciprocal (or Rational): 3 options

a) 2 POI



b) 1 point

c) No points of I

## 2 types of math applications or Questions

- Find the coordinates of the points of intersection of

$$y = f(x) = 2x^2 - x + 1$$

$$y = g(x) = \frac{1}{2}x + 3$$

YOU CAN DO THE SAME EXACT WORK TO SOLVE BOTH APPLICATIONS HOWEVER, YOUR ANSWER WOULD BE DIFFERENT DEPENDING ON THE Question!

HERE, YOU MUST GIVE ANSWER AS A POINT  
IT SHOULD LOOK LIKE: (x,y)

- Given

$$f(x) = 2x^2 - x + 1$$

$$g(x) = \frac{1}{2}x + 3$$

Solve for  $f(x) = g(x)$

$$2x^2 - x + 1 = \frac{1}{2}x + 3$$

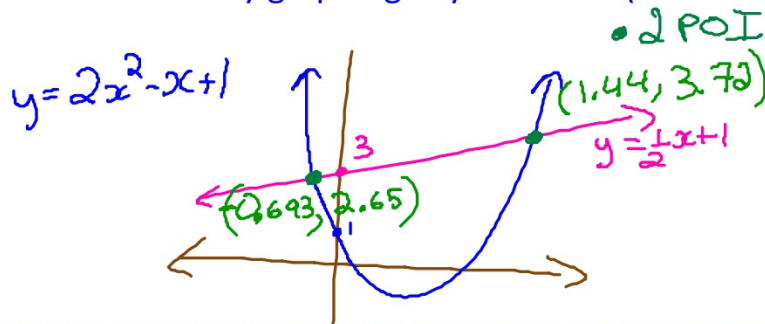
$$2x^2 - x - \frac{1}{2}x + 1 - 3 = 0$$

$$2x^2 - \frac{3}{2}x - 2 = 0$$

HERE, YOU ARE SOLVING AN EQUATION, HENCE YOU ONLY GIVE THE X-COORDINATE.  
your answer should look like:

x=     or x=

Method 1: by graphing in your GDC. (instructions in slide below)



When you graph in your GDC, you would get the coordinates of both points.  
(GDC instructions at later slide)

Now remember!!!!

■ If the question is asking for the solution of the equation  $f(x) = g(x)$   
your answer should be:

x=0.693 and/or x=1.44 Do not mention the y-coordinates.

■ If the question is asking for the points of intersection between the two curves,  
then your answer should be:

(-0.693, 2.65) and (1.44, 3.72)

Method 2: Solve the equation  $f(x)=g(x)$

$$2x^2 - x + 1 = \frac{1}{2}x + 3$$

$$2x^2 - x - \frac{1}{2}x + 1 - 3 = 0 \quad \text{Rearranged}$$

$$2x^2 - \frac{3}{2}x - 2 = 0 \quad \text{Simplified}$$

Solve<sup>2</sup> use polynomial tools in GDC

$$a_2 = 2 \quad a_1 = -1.5 \quad a_0 = -2$$

$$x = -0.693 \quad \text{or} \quad x = 1.44$$

Now, if they were asking to solve the equation, you are DONE!!!

However, if the question was asking for the POIs, then you still need to find the y-coordinates of both points with the x-coordinates you just found.

$$\text{For } x = -0.693 \Rightarrow y = \frac{1}{2}(-0.693) + 3 \Rightarrow y = 2.65$$

$$y = 2(-0.693)^2 - (-0.693) + 1 \Rightarrow y = 2.65$$

$$\text{For } x = 1.44 \Rightarrow \left. \begin{array}{l} y = \frac{1}{2}(1.44) + 3 \\ \text{or } y = 2(1.44)^2 - (1.44) + 1 \end{array} \right\} \Rightarrow y = 3.72$$

Answer  
 $(-0.693, 2.65)$   
 $(1.44, 3.72)$

Trickier equation to solve "by hand". If you solve by graphing, it just as easy as before.

$$f(x) = x^2 \quad g(x) = 4 - \frac{1}{x}$$

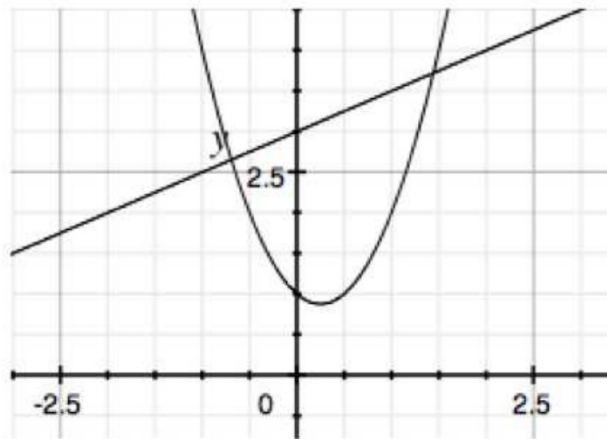
$$x(x^2) = \left(4 - \frac{1}{x}\right)x$$

$$x^3 = 4x - 1$$

$$\textcircled{0} = -x^3 + 4x - 1$$

Here use your polynomial tools from GDC!!!

Method: graph on your GDC!



And find the points of intersections (POI):

TI-84s: 2nd Trace (=Calc), then 5: Intersection, then get close to the POI and hit enter 3 times (first curve, second curve, Guess?)

N-Spire: in graph, press menu, then 6: Analyze Graph, then 4: Intersection  
You have to shade the area of the POI (lower bound? and upper bound?)