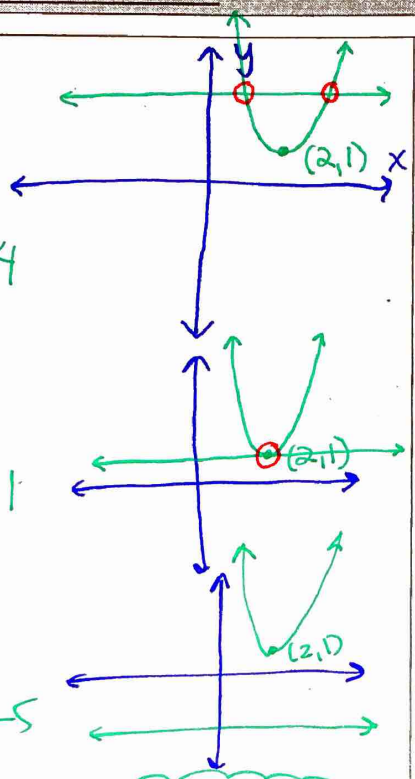
LC MATH I

Unit Overview #3: How to determine the number of solutions

Graph sketching



Two solutions if...

there are 2 intersections

ex $2(x-2)^2+1=4$

One solution if...

There is one intersection

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

No solutions if...

There are no intersections

ex $2(x-2)^2+1=-5$

Square Roots

Two solutions if...

x^2 = positive #

$x^2=20$

$x=\pm\sqrt{20}$

$x=\{\pm 2\sqrt{5}\}$

One solution if...

$x^2=0$

$x=0$ ← one solution only

No solutions if...

x^2 = negative #

ex $x^2=-16$

$x=\pm\sqrt{-16}$

no solution

By using the Quadratic Formula: The "discriminant"

b^2-4ac

Two solutions if...

The discriminant is positive

ex $x^2-4x+2=0$

$b^2-4ac=(-4)^2-4(1)(2)$

$=16-8$

$=8$ ← positive

$\Rightarrow$ 2 solns.

One solution if...

The discriminant is 0

ex $x^2-4x+4=0$

$b^2-4ac=(-4)^2-4(1)(4)$

$=16-16$

$=0$

$\Rightarrow$ 1 soln.

No solutions if...

The discriminant is negative

ex $x^2-4x+6=0$

$b^2-4ac=(-4)^2-4(1)(6)$

$=16-24$

$=-8$

$\rightarrow$ 0 solns

Factoring:

Two solutions if...

If I can find two solutions

$x^2-25=0$

$(x+5)(x-5)=0$

$x=\{-5,5\}$

One solution if...

the two factors are exactly the same (a perfect square),

$x^2-10x+25=0$

$(x-5)(x-5)=0$

$x=\{5\}$

If I can't factor (the expression is prime), **then I need to pick another method.**

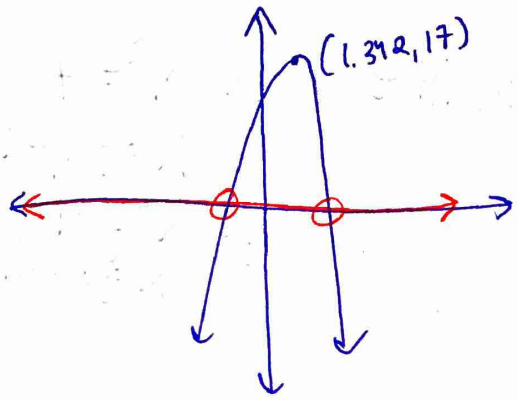
It doesn't mean that there are no solutions. It just means that factoring won't work.

You can't figure out that an equation has no solution by factoring

How many solutions do these equations have?

$-5(x-1.342)^2+17=0$

GRAPHING...



2 solutions

$3x^2=-12$

TAKE SQ. ROOTS

$3x^2=-12$

$x^2=-4$

$x=\pm\sqrt{-4}$

↑ not possible

NO solution

$4x^2+2x=-12$

$+12 \quad +12$

$\frac{4x^2+2x+12}{2}=\frac{0}{2}$

$2x^2+x+6=0$

$a=2 \quad b=1 \quad c=6$

$b^2-4ac=1^2-4(2)(6)$

$=1-48$

$=-47$ ← negative discriminant

NO solution

$x^2+35=-12x$

$+12x \quad +12x$

$x^2+12x+35=0$

$a=1 \quad b=12 \quad c=35$

$b^2-4ac=12^2-4(1)(35)$

$=144-140$

$=4$ ← positive discriminant

2 solutions