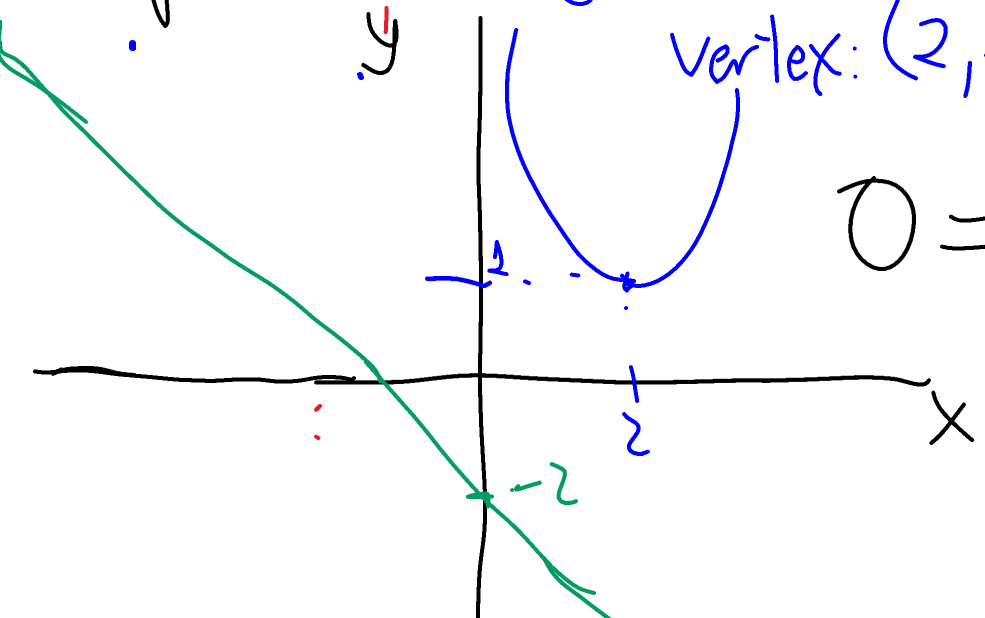
LINEAR-QUADRATIC EQUATIONS

Tue 2 Apr 2019

Review example:

Find the intersection point(s) between the line $y = -3x - 2$ & the parabola $y = (x-2)^2 + 1$



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

$-3x - 2 = x^2 - 2 \cdot 2x + 4 + 1 = x^2 - 4x + 5$

$0 = x^2 - 4x + 3x + 5 + 2$

$0 = x^2 - x + 7$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$a = 1$, $b = -1$, $c = 7$

$x = \frac{1 \pm \sqrt{1^2 - 4 \cdot 1 \cdot 7}}{2 \cdot 1} = \frac{1 \pm \sqrt{1 - 28}}{2} = \frac{1 \pm \sqrt{-27}}{2}$

NO SOLUTION

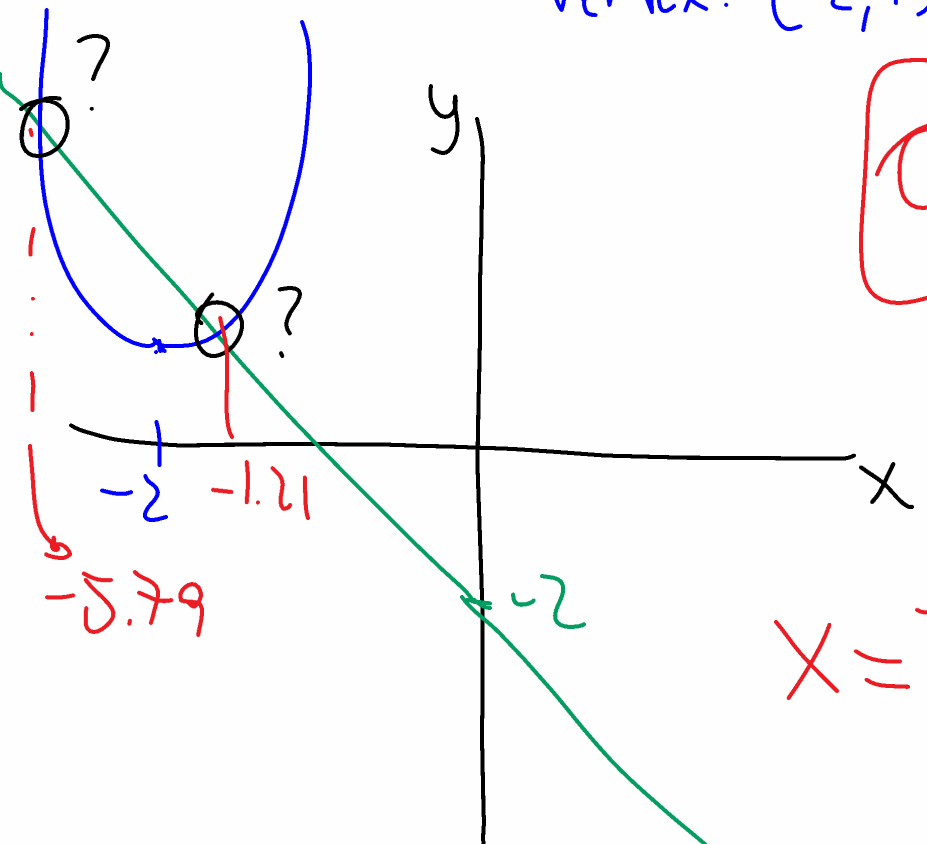
Hence they do NOT intersect!

Find the intersection of

$y = -3x - 2$

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

vertex: $(-2, 1)$



Sol: Equate both expressions

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

$-3x - 2 = x^2 + 4x + 4 + 1 = x^2 + 4x + 5$

$0 = x^2 + 4x + 3x + 5 + 2 = x^2 + 7x + 7$

$a=1 \quad b=7$ $(\Rightarrow$

$x = \frac{-7 \pm \sqrt{7^2 - 4 \cdot 1 \cdot 7}}{2 \cdot 1} = \frac{-7 \pm \sqrt{49 - 28}}{2}$

$x = \frac{-7 \pm \sqrt{21}}{2} \simeq \frac{-7 \pm 4.58}{2} =$ $+$: $\frac{-7 + 4.58}{2} \simeq -1.21$

$-$: $\frac{-7 - 4.58}{2} \simeq -5.79$

(cont.

$y \simeq -3(-1.21) - 2 = 3.63 - 2 = 1.63$

$y \simeq -3(-5.79) - 2 = 17.37 - 2 = 15.37$

Hence, the two intersection points are

$(-1.21, 1.63)$ and $(-5.79, 15.37)$