Notes

PC 11

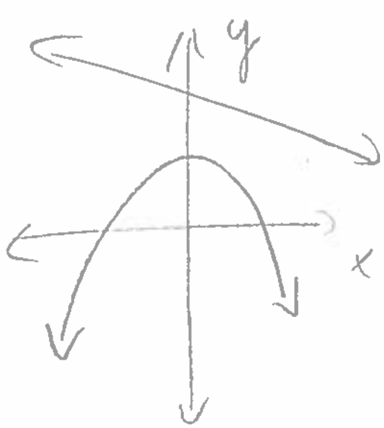
Solving a System of Quadratic – Linear ~~System of~~ Equations

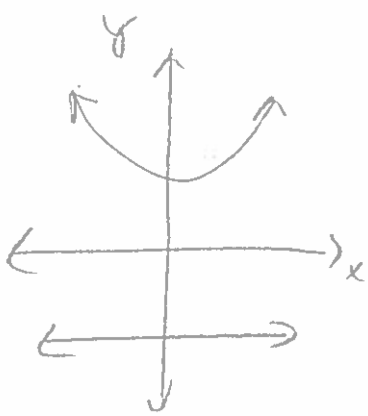
- There are 3 possible scenarios when solving a quadratic-~~quadratic~~ Linear system.
- Unlike a Linear-Linear and Quadratic-Quadratic systems that can have infinitely many solutions, Quadratic-Linear system cannot have infinitely many solutions.

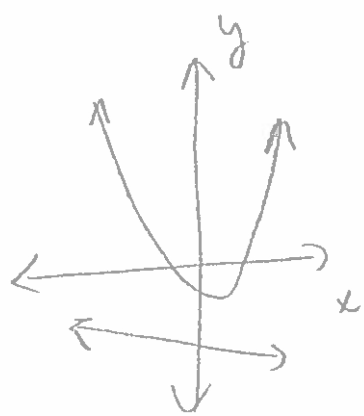
1. There are no real solutions to the system

- When graphed, the parabola and the line never intersect
- When solving algebraically resulting equation does not have real solutions.

Examples:







Solve:

$$3x^2 + 10 = y$$
$$y = -0.5x + 5$$

$3x^2 + 10 = -0.5x + 5$

$3x^2 + 0.5x + 5 = 0$

$6x^2 + 1x + 10 = 0$

$a = 6$
$b = 1$
$c = 10$

$x = \dfrac{-1 \pm \sqrt{1^2 - 4(6)(10)}}{2(6)}$

$x = \dfrac{-1 \pm \sqrt{-239}}{12}$

$D < 0 \Rightarrow \therefore$ No $\mathbb{R}$ solutions.

$* \ x = 3$ find "y" : $2(3) - 4 = y$

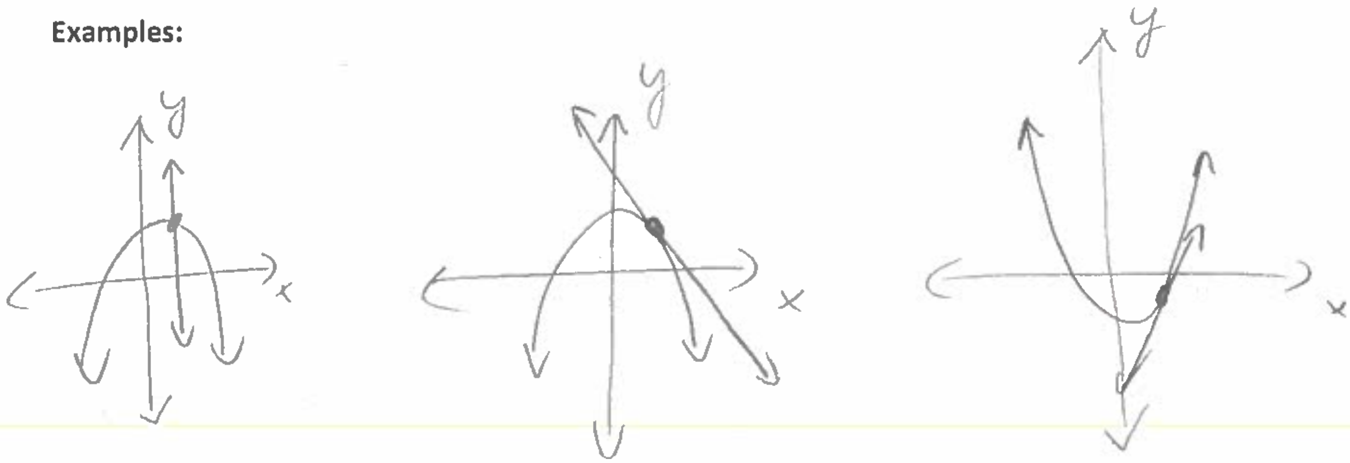
$$6 - 4 = y$$

$$2 = y$$

2. **There is one solution to the system**

- When graphed, the parabola and the line either touch (the line is a tangent line to the parabola) or the graphs intersect once.

Examples:



Solve:

$$y = -(x-4)^2 + 3$$

$$2x - 4 = y$$

$$2x - 4 = -(x-4)^2 + 3$$

$$2x - 4 = -x^2 + 8x - 16 + 3$$

$$\frac{0}{-1} = \frac{-x^2}{-1} + \frac{6x}{-1} - \frac{9}{-1}$$

$$0 = x^2 - 6x + 9$$

$a = 1$

$b = -6$

$c = 9$

OR

$$0 = (x-3)(x-3)$$

$$x - 3 = 0$$

$$\boxed{x = 3}$$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(9)}}{2(1)}$$

$$x = \frac{6 \pm \sqrt{36 - 36}}{2}$$

$D = 0 \Rightarrow x = \frac{6}{2} = \underline{\underline{3}}$ $\circledast$

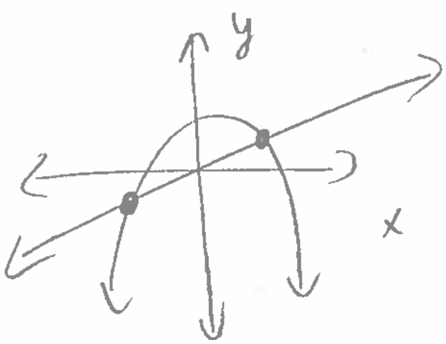
$\therefore$ The solution is $x = 3$.

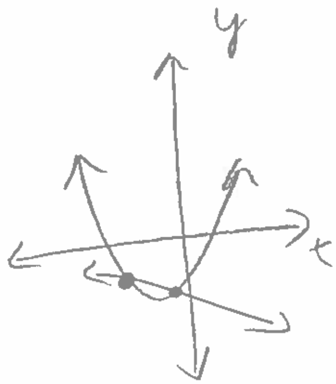
OR The solution is $(3, 2)$

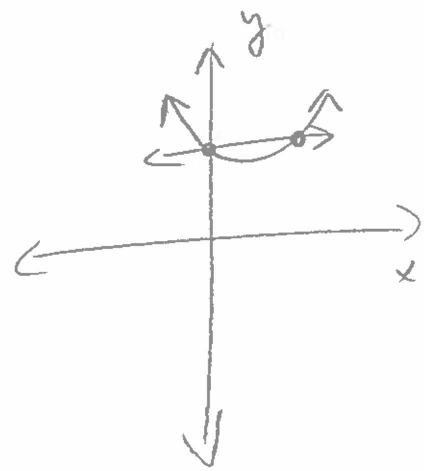
3. There are two solutions to the system

- When graphed, the parabola and the line intersect twice.
- The line is a secant line to the parabola.
- When solving algebraically, the resulting equation has two solutions (the discriminant is positive).

Examples:







Solve:

$$y = -3x^2 + 6x + 2$$

$$y - 3 = 0.75(x - 1)$$

$$-3x^2 + 6x + 2 - 3 = 0.75x - 0.75$$

$$-3x^2 + 6x - 1 = 0.75x - 0.75$$

$$(0 = 3x^2 - 5.25x + 0.25)^{\times 4}$$

$$0 = 12x^2 - 21x + 1$$

$a = 12$

$b = -21$

$c = 1$

$$x = \frac{-(-21) \pm \sqrt{(-21)^2 - 4(12)(1)}}{2(12)}$$

$$x = \frac{21 \pm \sqrt{393}}{24}$$

$$x = \frac{21 + 19.82}{24} \doteq \underline{\underline{1.70}}$$

$$x = \frac{21 - 19.82}{24} \doteq \underline{\underline{0.049}}$$