Warm Up

Solve:

$$70x - y + 240 = 0$$

(7, 730)

$$100\left(\frac{-9x}{10} + \frac{y}{100} = 1\right)$$

(1) $-90x + y = 100$

$+ \quad 70x - y = -240$

$\frac{-20x}{-20} = \frac{-140}{-20}$

$x = 7$

(2) $70(7) - y + 240 = 0$

$490 + 240 = y$

$730 = y$

Lesson 27

Semi-Linear Systems

Semi-Linear Systems

Defn: a system of first-degree (line) and second degree (parabola) equations.

Ex 1: $y_1 = x^2 - 6x + 11$

$y_2 = 2x - 4$

Using Comparison:

$$y_1 = y_2$$
$$x^2 - 6x + 11 = 2x - 4$$

Semi-Linear Systems

Ex 1: $x^2 - 6x + 11 = 2x - 4$

$x^2 - 8x + 15 = 0$

Factor: $(x - 5)(x - 3) = 0$

Case 1:

$x - 5 = 0$

$x = 5$

Case 2:

$x - 3 = 0$

$x = 3$

Semi-Linear Systems

Ex 1: $x^2 - 6x + 11 = 2x - 4$

$x^2 - 8x + 15 = 0$

Factor: $(x - 5)(x - 3) = 0$

Case 1: $x - 5 = 0$, $x = 5$

Case 2: $x - 3 = 0$, $x = 3$

Semi-Linear Systems

Ex 1:

Case 1: $x = 3$

Plug it in: $y = 2(3) - 4$

$y = 2$

$(3, 2)$

Case 2: $x = 5$

$y = 2(5) - 4$

$y = 6$

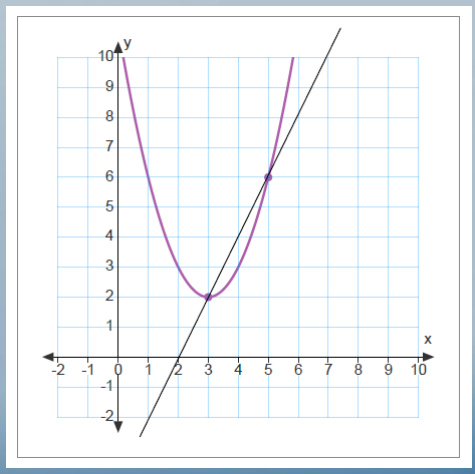
$(5, 6)$

Semi-Linear Systems

Ex 1: $(3, 2)$ $(3, 6)$

Graphically:

2 solutions



Semi-Linear Systems

Ex 2: $y = -x^2 + 2x + 3$

$y = -2x + 7$

$-x^2 + 2x + 3 = -2x + 7$

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

Factor: $0 = (x-2)(x-2)$

Case 1:

$0 = x - 2$

$x = 2$

Plug it in:

$y = -2(2) + 7$

$y = 3$

$(2, 3)$

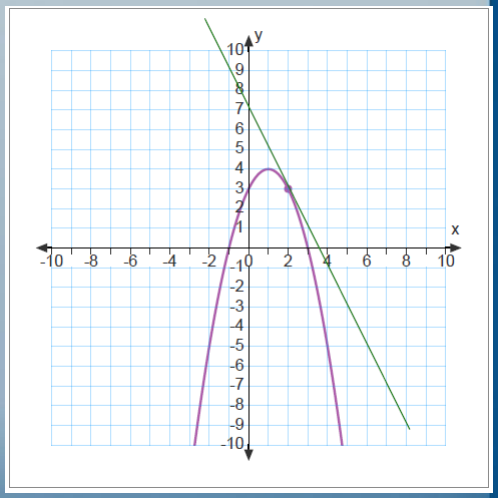
Semi-Linear Systems

Ex 2: $(2, 3)$

Graphically:

1 solution

Line is tangent to the parabola



Semi-Linear Systems

Ex 3: $y = x^2 - 6x + 4$

$y = -3x - 1$

$x^2 - 6x + 4 = -3x - 1$

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

Factor: $\Delta = b^2 - 4ac$

$\Delta = (-3)^2 - 4(1)(5)$

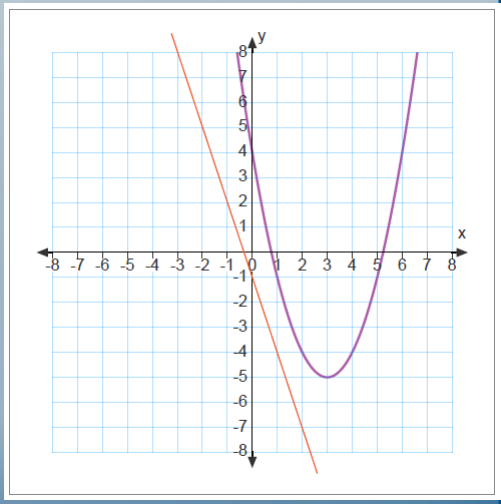
$\Delta = -11 \quad \therefore no\ solution$

Semi-Linear Systems

Ex 3:

Graphically:

No solution



Semi-Linear Systems

Summary

There are 3 possible cases when solving a system of a linear equation & second degree equations:

a) two solutions
b) one solution
c) no solution

Semi-Linear Systems

Word Problems

Ex 4. A father is three times older than his son. The sum of the squares of their ages is 2250. How old are they?

Semi-Linear Systems

Ex 4: $x: son's\ age \quad y: father's\ age$

$$y = 3x$$
$$x^2 + y^2 = 2250$$

By Substitution:

$$x^2 + (3x)^2 = 2250$$
$$x^2 + 9x^2 = 2250$$
$$10x^2 = 2250$$
$$x^2 = 225$$
$$x = \pm 15$$
$$\therefore x = 15$$

Plug it in:

$$y = 3(15) = 45$$

$$\therefore son\ is\ 15\ \&\ father\ is\ 45$$

Semi-Linear Systems

Ex 5: Jimmy went skeet-shooting. The trajectory of the clay pigeon followed a second-degree function. If the machine were placed at the origin of a Cartesian plane, then the pigeon reached a maximum height of 25m at a distance of 50m from the machine. Jimmy's shot followed a linear path whose equation was $y = -0.2x + 35$. At what distance from the machine did he hit the pigeon if he hit it on its way up?

Semi-Linear Systems

Ex 6: The perimeter of a rectangle is 28cm and its diagonal measures 10cm. What are the dimensions of this rectangle?

Homework

Workbook

P. 179 #1 – 4
P. 180 #1 & 2
P. 181 #3 - 7