Unit 3 Evaluations

- Monday, April 4 - In-class Assignment (data collection) rm 125
- Tuesday, April 5 - In-class Assignment completion (open book) rm 120
- Thursday, April 7 - Unit 'Quest' (2 categories;knowledge and thinking)

3.8 Linear-Quadratic Systems

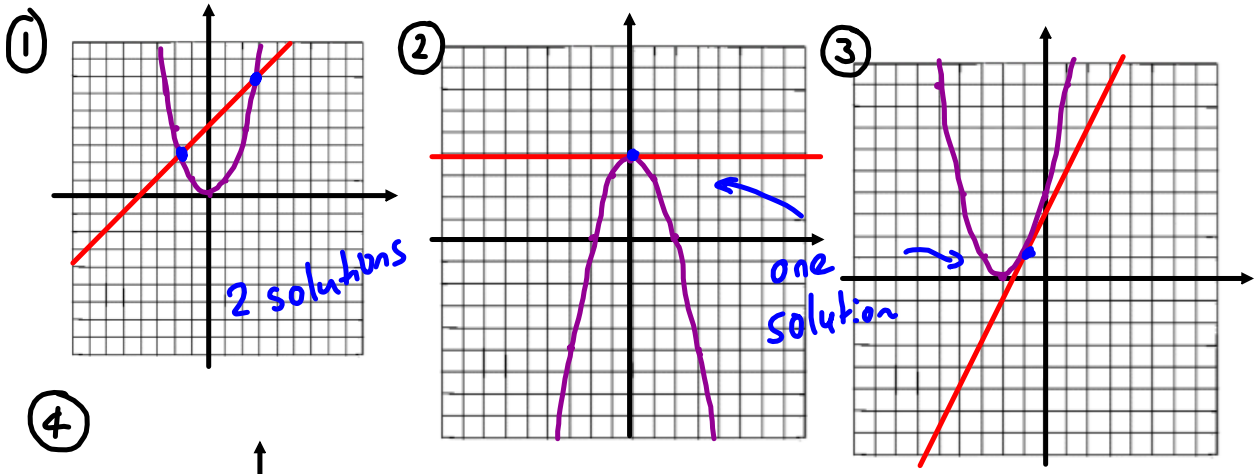
Warm Up

On the same set of axes, sketch:

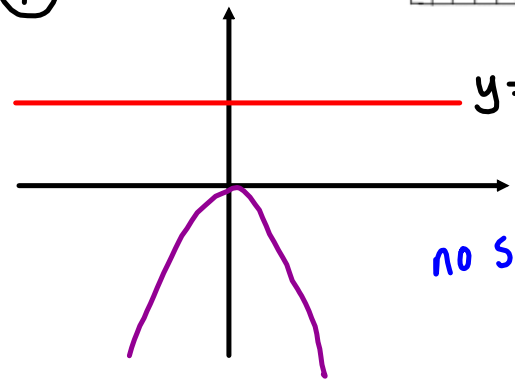
① $y = x + 5$ and $y = x^2$

② $y = 4$ and $y = -x^2 + 4$

③ $y = 2x + 3$ and $y = (x + 2)^2$



④ $y = 3$ and $y = -x^2$



A system of equations that include a linear function and a quadratic function may have zero, one or two solutions.

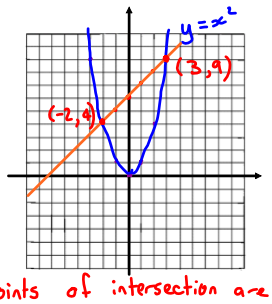
(points of intersection)

1. Find the point(s) of intersection by graphing.
   a) $f(x) = x^2, g(x) = x + 6$
   b) $f(x) = -2x^2 + 3, g(x) = 0.5x + 3$
   c) $f(x) = (x - 3)^2 + 1, g(x) = -2x - 2$

2. Determine the point(s) of intersection algebraically.
   a) $f(x) = -x^2 + 6x - 5, g(x) = -4x + 19$
   b) $f(x) = 2x^2 - 1, g(x) = 3x + 1$
   c) $f(x) = 3x^2 - 2x - 1, g(x) = -x - 6$

3. Determine the number of points of intersection of $f(x) = 4x^2 + x - 3$ and $g(x) = 5x - 4$ without solving.

Examples 1/ a)



∴ The points of intersection are (-2,4) and (3,9)

2/ $y = 2x^2 - 1$ ①
$y = 3x + 1$ ②

sub ① into ② → $2x^2 - 1 = 3x + 1$

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

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

$2x(x-2) + 1(x-2) = 0$

$(2x+1)(x-2) = 0$

∴ $x = -\frac{1}{2}, 2$

sub $x = -\frac{1}{2}$ into ①

$y = 2(-\frac{1}{2})^2 - 1$

$= 2(\frac{1}{4}) - 1$

$= \frac{1}{2} - 1$

$y = -\frac{1}{2}$

sub $x = 2$ in ①

$y = 2(2)^2 - 1$

$= 8 - 1$

$y = 7$

∴ The points of intersection are $(-\frac{1}{2}, -\frac{1}{2})$ and $(2, 7)$

Ex3 Determine the number of points of intersection of $f(x) = 2x + 5$ and $g(x) = x^2 - 8x + 30$

$2x + 5 = x^2 - 8x + 30$

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

$b^2 - 4ac = (-10)^2 - 4(1)(25)$

$= 100 - 100$

$= 0$

∴ one point of intersection

Note
If $b^2 - 4ac = 0$, one POI
$b^2 - 4ac > 0$, two POI
$b^2 - 4ac < 0$, no POI

8. Determine the value of k such that $g(x) = 3x + k$ intersects the quadratic function $f(x) = 2x^2 - 5x + 3$ at exactly one point.

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

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

$$2x^2 - 8x + (3 - k) = 0$$

one POI indicates that $b^2 - 4ac = 0$

$$\therefore \quad (-8)^2 - (4)(2)(3-k) = 0$$

$$64 - 8(3-k) = 0$$

$$64 - 24 + 8k = 0$$

$$40 + 8k = 0$$

$$k = -\frac{40}{8}$$

$$\therefore \underline{k = -5}$$

H/W p198 #1,3,4,7,9,12