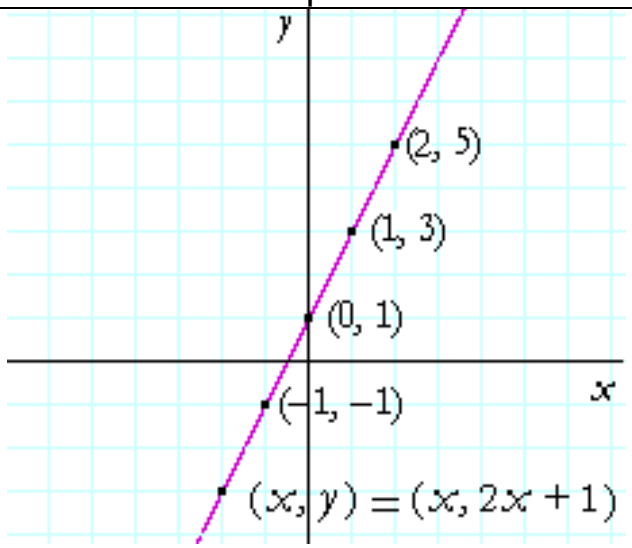
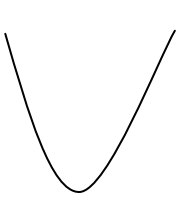
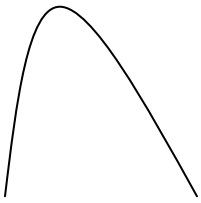
For comments, corrections, etc…Please contact Ahnaf Abbas: ahnaf@uaemath.com

International Institute
for Technology and Management

Unit 05a : Mathematics 1 **Handout #3**

BasicsIII: Graphing

Study Guide pp 17-22; Anthony & Biggs pp 17-19

Topic	Interpretation
Graphs The graph of an equation in two variables is the set of points in the plane whose coordinates are solutions of the equation. Example: Sketch the graph of y =2x + 3 Construct a table of y-values for a reasonable number of x-values: x | y = 2x+1 | (x,y) -1 | -1 | (-1,-1) 0 | 1 | (0,1) 1 | 3 | (1,3) 2 | 5 | (2,5)	 x-intercept: ∩ x-axis: y = 0 2x+ 1 = 0 ⇒ x = $\frac{-1}{2}$; ($\frac{-1}{2}$, 0) y-intercept: ∩ y-axis : x = 0 y = 2(0) + 1 = +1 ; (0 ,1)
Quadratic Curves $Y = ax^2 + bx + c$ x= $\frac{-b}{2a}$ is the axis of symmetry and the x-value of the vertex Example: the vertex of the Parabola : $Y = 2x^2 - 4x + 5$ a = 2 , b = - 4 and c = 5 x = $\frac{-b}{2a} = \frac{4}{4} = 1$ Substitute this in Y : $Y = 2(1)^2 - 4(1) + 5 = 3$ the vertex : (1 , 3)	 a > 0  a < 0

Example:
Sketch the graph of
$y = 2x^2 + 2x - 4$
a=2 , b = 2 , c = -4

1.) Vertex: x= $\frac{-b}{2a}$ =

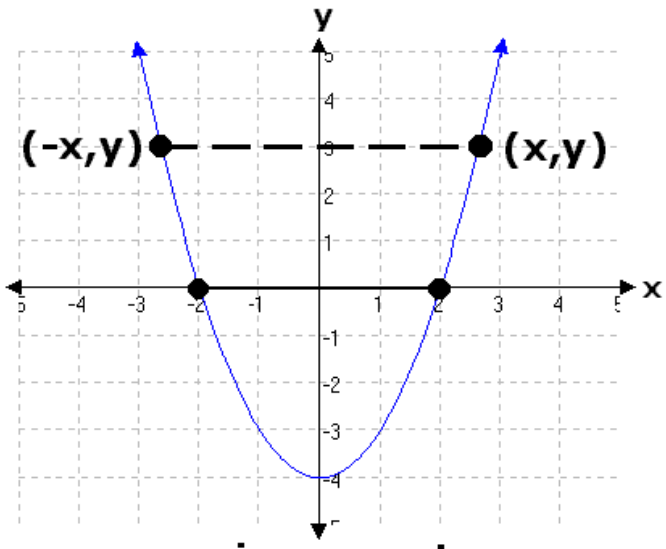
$\frac{-2}{4} = \frac{-1}{2}$ Substitute this in y :

y = $\frac{-9}{2}$ $\Rightarrow$ V($\frac{-1}{2}, \frac{-9}{2}$)

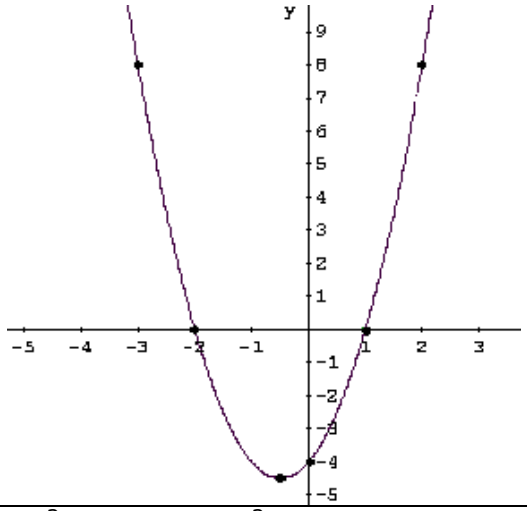
2.) x-intercept : y = 0
$2x^2 + 2x - 4 = 0$
$(2x - 2)(x+2) = 0$
x = 1 or x = - 2
(1,0) ; (-2,0)

3.) y-intercept : x = 0
$y = 2(0)^2 + 2(0) - 4 = -4$
(0,-4)

In case where there are no x-intercepts, construct a table of y-values as in the first example.



y-axis symmetry



Intersection points

Set y = y and solve for x.

Example :

Let f(x) = $4x^2-8x-1$ and
g(x) = $-4x^2 - 2x + 4$

Determine the positive value of x at which these two graphs intersect.
(LSE 2004)

$4x^2-8x-1 = -4x^2 - 2x + 4$
$8x^2 - 6x - 5 = 0$
a = 8 , b = - 6 , c = - 5

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{6 \pm \sqrt{36+160}}{16}$$

$$x = \frac{6 \pm \sqrt{196}}{16} = \frac{6 \pm 14}{16}$$

Either $x = \frac{6-14}{16} = \frac{-8}{16} = \frac{-1}{2}$

Or $x = \frac{6+14}{16} = \frac{20}{16} = \frac{5}{4}$ > 0 which is the required.