ANTENNA AND WAVE PROPAGATION

Parabola Properties

1. Graphing Parabolas
2. Finding Maximum and Minimum Values

1) Graphing Parabolas

$$y = ax^2 + bx + c$$

When $b = 0$, it becomes…

$$y = ax^2 + c$$

The **vertex** of a graph of $y = ax^2 + c$ is the y-intercept, **$(0, c)$**

1) Graphing Parabolas

Example 1:

Graph $y = 2x^2 - 1$

1) Graphing Parabolas

Example 1:

Graph $y = 2x^2 - 1$

Step 1: Graph the vertex at (0, -1).

Step 2: Make a table of values using points on one side of *x*-axis.

Step 3: Sketch the curve.

1) Graphing Parabolas

Example 1:

Graph $y = 2x^2 - 1$

x	y
1	
2	
3	
4	

1) Graphing Parabolas

Example 1:

Graph $y = 2x^2 - 1$

x	y
1	$2(1)^2 - 1 = 1$
2	$2(2)^2 - 1 = 7$
3	$2(3)^2 - 1 = 17$
4	$2(4)^2 - 1 = 31$

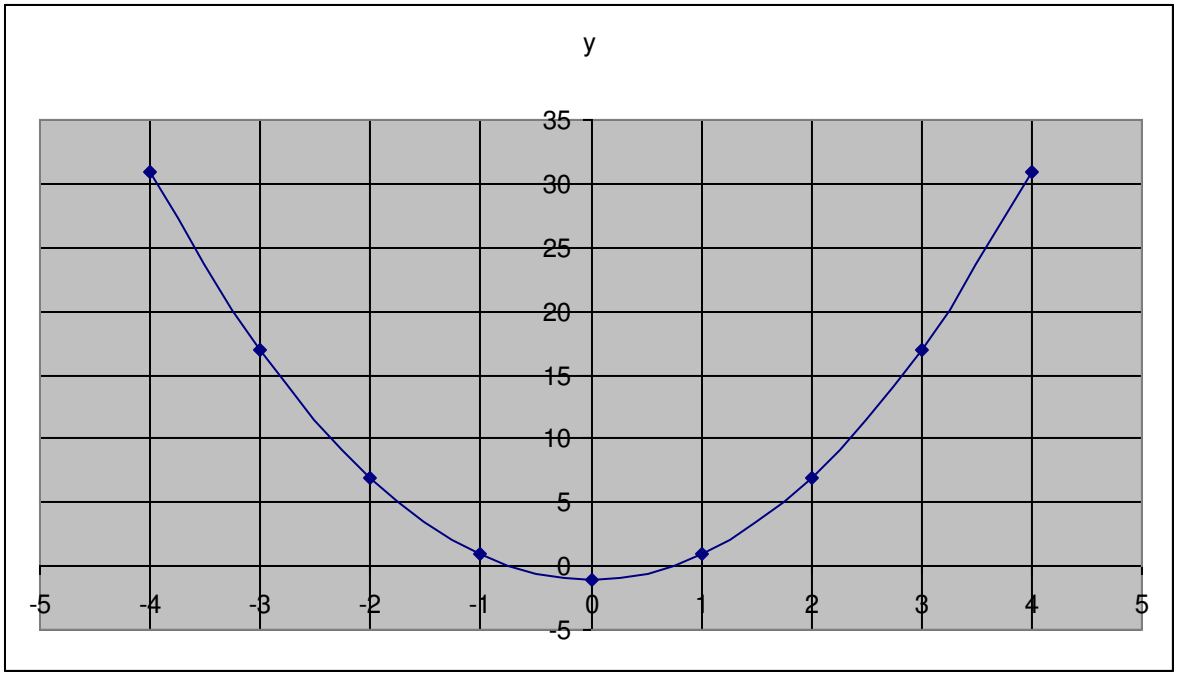
1) Graphing Parabolas

Example 1:

Graph $y = 2x^2 - 1$

Take advantage of **corresponding points** to graph the other side of the parabola.

x	y
1	1
2	7
3	17
4	31



1) Graphing Parabolas

For the equation $y = ax^2 + bx + c$,

the axis of symmetry is at

$$-\frac{b}{2a}$$

I) Graphing Parabolas

Example 2:

Graph $y = x^2 - 2x - 3$.

1) Graphing Parabolas

Example 2:

Graph $y = x^2 - 2x - 3$.

Step 1: Find the axis of symmetry.

Axis of symmetry: $-\frac{b}{2a} = -\frac{(-2)}{2(1)} = 1$

Equation for the axis of symmetry: **$x = 1$**

1) Graphing Parabolas

Example 2:

Graph $y = x^2 - 2x - 3$.

Step 2: Find the vertex.

Sub $x = 1$ into the equation, solve for y.

$$y = (1)^2 - 2(1) - 3$$
$$y = -4$$

The vertex is at (1, -4).

1) Graphing Parabolas

Example 2:

Graph $y = x^2 - 2x - 3$.

Step 3: Plot points and sketch the graph.

x	y
1	-4
2	
3	
4	

I) Graphing Parabolas

Example 2:

Graph $y = x^2 - 2x - 3$.

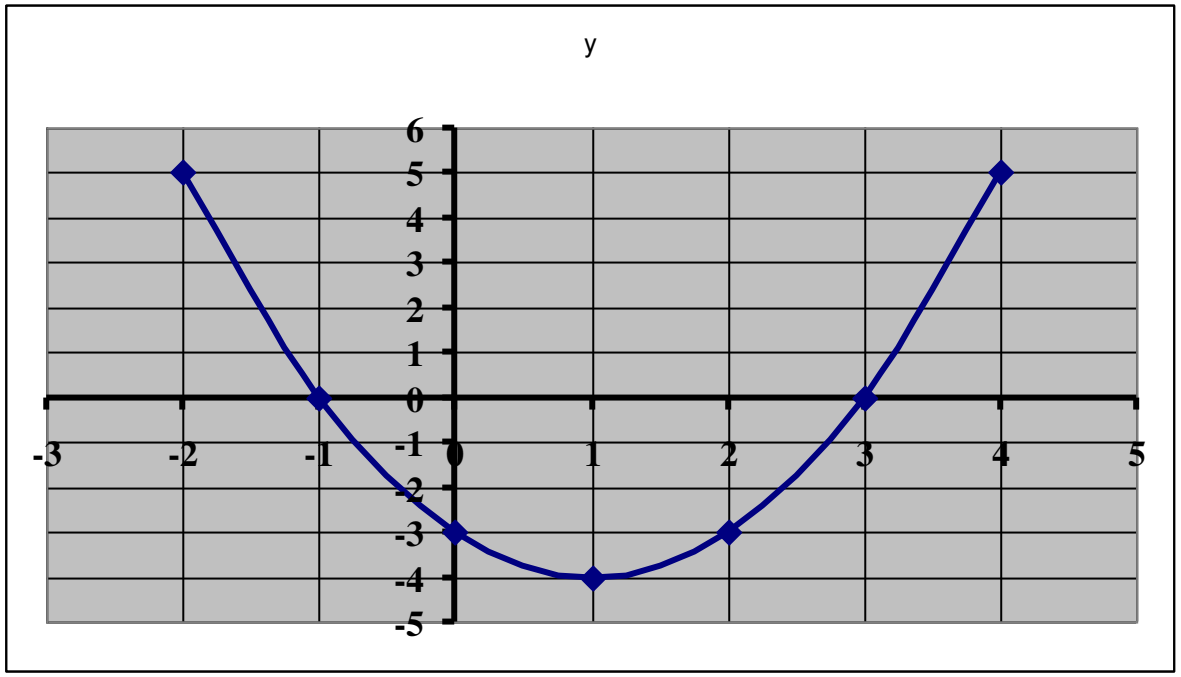
Step 3: Plot points and sketch the graph.

x	y
1	-4
2	$(2)^2 - 2(2) - 3 = -3$
3	$(3)^2 - 2(3) - 3 = 0$
4	$(4)^2 - 2(4) - 3 = 5$

1) Graphing Parabolas

Example 2:

Graph $y = x^2 - 2x - 3$.



2) Finding Maximum and Minimum Values

The maximum or minimum occurs at the vertex..

If $a < 0$, the graph opens DOWN and the vertex is a MAXIMUM.

If $a > 0$, the graph opens UP and the vertex is a MINIMUM.