

Graphing a Second-Degree Equation

In order to sketch a parabola which represents a second-degree equation, the following steps will be involved:

1. Find the zeros (x -intercepts). (We already know how to do this; by factoring or quadratic formula.)
2. Find the coordinates of the vertex. (Will be covered in this handout.)
3. Determine the axis of symmetry. (Will be covered in this handout.)
4. Determine the y -intercept ($0, c$). (Will be covered in this handout.)
5. Make a table of values if necessary to complete a "picture" of the parabola's shape.

You can imagine that once the information above is plotted, a nice parabolic curve will be visible! (There are four graphing questions on the exam for a total of 35%, so take heed!)

We will cover each of the above steps **one at a time** and then we'll put it all together!

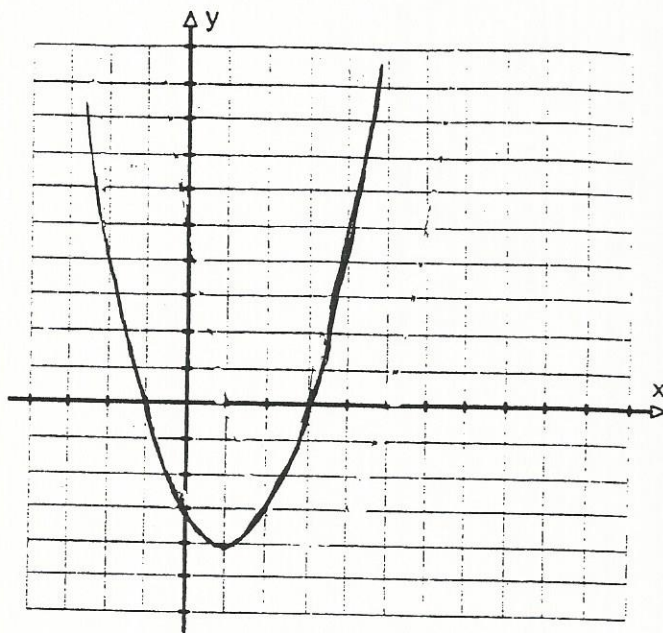
Finding the Coordinates of the Vertex

Procedure for finding the vertex of a parabola:

1. Write the equation in the form $y = ax^2 + bx + c$.
2. Identify the values of a , b and c .
3. Find the discriminant using the formula $\Delta = b^2 - 4ac$.
4. Find the coordinates of the vertex using the formula $\left(\frac{-b}{2a}, \frac{-\Delta}{4a}\right)$.
5. Check whether the point obtained in Step 4 is correct by substituting its coordinates for the variables x and y in the original equation.

① By referring to the following graph, determine the characteristics listed below.

Scale
x-axis:
0.5 cm $\hat{=}$ 1 unit
y-axis:
0.5 cm $\hat{=}$ 1 unit



Coordinates of the vertex:

Zero(s):

Equation of the axis of symmetry:

y-intercept:

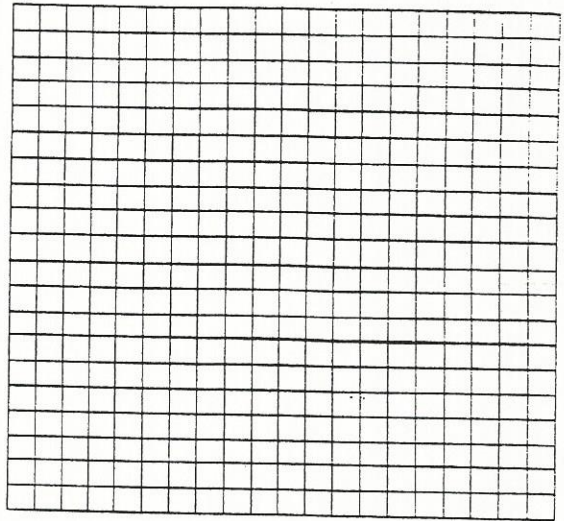
Minimum:

② Graph the equation below:

$$y = 2x^2 - 4x$$

Then determine the characteristics listed below and draw the axis of symmetry.

x	y



Coordinates of the vertex: _____

Coordinates of the y-intercept: _____

Coordinates of the point symmetric with the y-intercept: _____

Coordinates of the zeros: _____

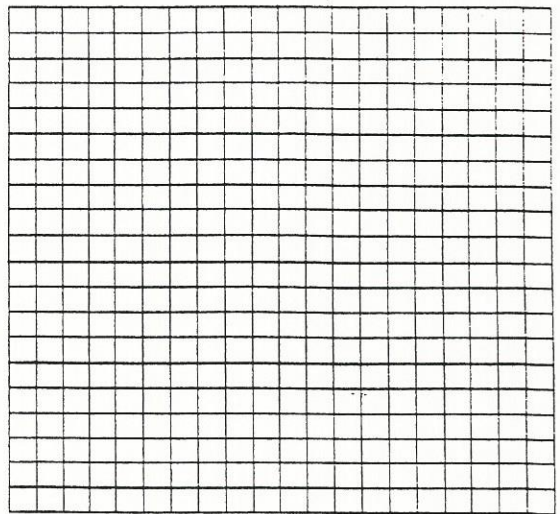
Equation of the axis of symmetry: _____

③ Graph the equation below:

$$y = \frac{1}{2}x^2 + x + \frac{5}{2}$$

Then determine the characteristics listed below and draw the axis of symmetry.

x	y



Coordinates of the vertex: _____

Coordinates of the y-intercept: _____

Coordinates of the point symmetric with the y-intercept: _____

Coordinates of the zeros: _____

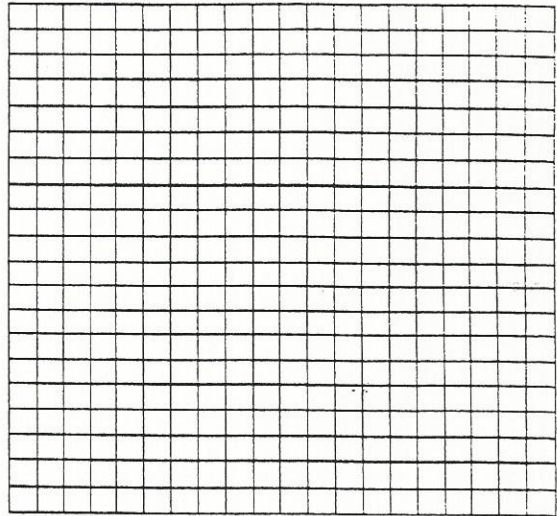
Equation of the axis of symmetry: _____

④ Graph the equation below:

$$y = \frac{1}{4}x^2 - 2x + 6$$

Then determine the characteristics listed below and draw the axis of symmetry.

x	y



Coordinates of the vertex: _____

Coordinates of the y-intercept: _____

Coordinates of the point symmetric with the y-intercept: _____

Coordinates of the zeros: _____

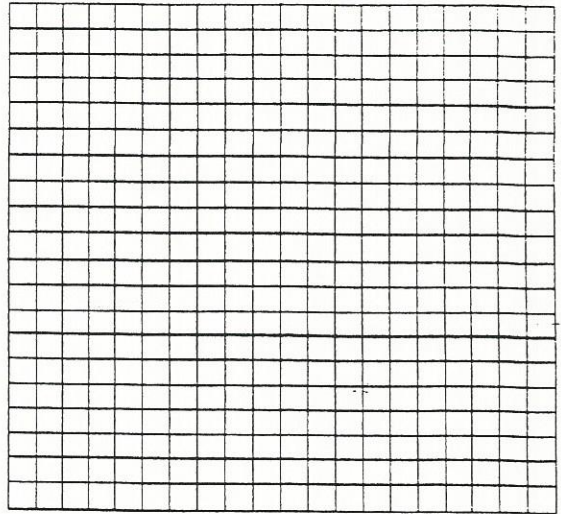
Equation of the axis of symmetry: _____

5 Graph the equation below:

$$y = -x^2 + 5x - 4$$

Then determine the characteristics listed below and draw the axis of symmetry.

x	y



Coordinates of the vertex: _____

Coordinates of the y-intercept: _____

Coordinates of the point symmetric with the y-intercept: _____

Coordinates of the zeros: _____

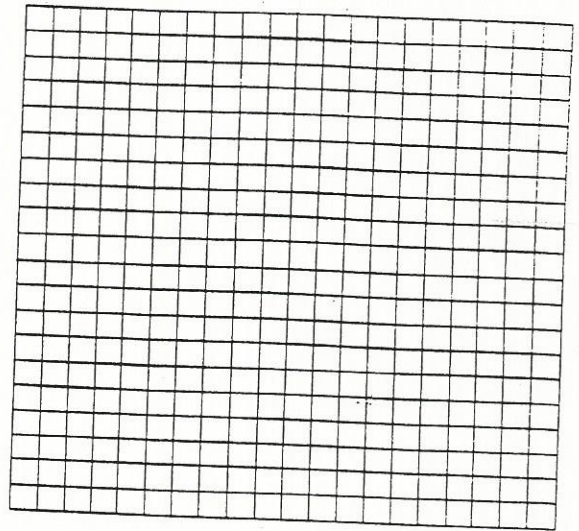
Equation of the axis of symmetry: _____

⑥ Graph the equation below:

$$y = 2x^2 + 4x - \frac{3}{2}$$

Then determine the characteristics listed below and draw the axis of symmetry.

x	y



Coordinates of the vertex: _____

Coordinates of the y-intercept: _____

Coordinates of the point symmetric with the y-intercept: _____

Coordinates of the zeros: _____

Equation of the axis of symmetry: _____