

5.

### Solution

Quadratic function: is a function that can be written in the form:

$y(q) = aq^2 + bq + c$  where  $a$ ,  $b$ , and  $c$  are real numbers and  $a \neq 0$

we have  $y(q) = 3q^2 + 9q + 24$ , note:  $3q^2 + 9q + 24$  is in  $qy$ -plane

Here, we know that  $a=3$ ,  $b=9$ ,  $c=24$

Since  $a > 0$ , we know that the  $y$ -coordinate of the vertex is a minimum. However, to find the  $y$ -coordinate of our vertex we first need to find the  $q$ -coordinate of the vertex by using  $q = -\frac{b}{2a} = -\frac{9}{6} = -\frac{3}{2}$ . Now that we have the  $q$ -coordinate, we can find the  $y$ -coordinate

of the vertex by finding  $y(-\frac{3}{2}) = 3(-\frac{3}{2})^2 + 9(-\frac{3}{2}) + 24 = \frac{27}{4} - \frac{27}{2} + 24 = \frac{99}{4}$  Minimum =  $\frac{99}{4}$