3.

Solution

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

$y(r) = ar^2 + br + c$ where a, b, and c are real numbers and $a \neq 0$

we have $y(r) = -r^2 + 11r + 19$, note: $-r^2 + 11r + 19$ is in ry-plane

Here, we know that a=-1, b=11, c=19

Since a<0 ,we know that the y-coordinate of the vertex is a maximum.However,to find the y-coordinate of our vertex we first need to find the r-coordinate

of the vertex by using $r = -\frac{b}{2a} = -\frac{11}{-2} = \frac{11}{2}$ Now that we have the r-coordinate, we can find the y-coordinate

of the vertex by finding $y\left(\frac{11}{2}\right) = -1\left(\frac{11}{2}\right)^2 + 11\left(\frac{11}{2}\right) + 19 = -\frac{121}{4} + \frac{121}{2} + 19 = \frac{197}{4}$ Maximum= $\frac{197}{4}$