3.

Solution

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

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

we have $x(r) = r^2 - 3r - 7$, note: $r^2 - 3r - 7$ is in rx-plane

Here, we know that $a=1$, $b=-3$, $c=-7$

Since $a>0$,we know that the x-coordinate of the vertex is a minimum. However,to find the x-coordinate of our vertex we first need to find the r-coordinate of the vertex by using $r = \frac{-b}{2a} = -\frac{-3}{2} = \frac{3}{2}$ Now that we have the r-coordinate, we can find the x-coordinate of the vertex by finding $x(\frac{3}{2}) = 1(\frac{3}{2})^2 - 3(\frac{3}{2}) - 7 = \frac{9}{4} - \frac{9}{2} - 7 = -\frac{37}{4}$ Minimum $= -\frac{37}{4}$