

1.

Solution

To find the vertex, we look at the coefficients in the function $r(x) = ax^2 + bx + c$ in this equation, $a = 1$ and $b = 8$

The first coordinate of the vertex has the formula: $\frac{-b}{2a}$ now, plugging into formula to get:

$$\frac{-b}{2a} = -\frac{8}{2(1)} = -4$$

The second coordinate of the vertex is $r(-4) = 1(-4)^2 + 8(-4) - 3$
 $= -19$

Therefore, the vertex of the graph of f is $(-4, -19)$