1.

Solution

To find the vertex, we look at the coefficients in the function $p(r)=ar^2+br+c$

in this equation, $a=2$ and $b=2$

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

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

The second coordinate of the vertex is $p(-\frac{1}{2}) = 2(-\frac{1}{2})^2+2(-\frac{1}{2})-4$

$=-\frac{9}{2}$

Therefore, the vertex of the graph of f is $(-\frac{1}{2},-\frac{9}{2})$