4.

Solution

To find the vertex, we look at the coefficients in the function $r(w)=aw^2+bw+c$
in this equation, $a=1$ and $b=3$
The first coordinate of the vertex has the formula: $\frac{-b}{2a}$ now, plugging into formula to get:

$\frac{-b}{2a}=-\frac{3}{2(1)}=-\frac{3}{2}$

The second coordinate of the vertex is $r(-\frac{3}{2}) = 1(-\frac{3}{2})^2+3(-\frac{3}{2})-3$

$=-\frac{21}{4}$

Therefore, the vertex of the graph of f is $(-\frac{3}{2},-\frac{21}{4})$