1.

Solution

To find the vertex, we look at the coefficients in the function $z(k)=ak^2+bk+c$
in this equation, $a=1$ and $b=4$
The first coordinate of the vertex has the formula: $\frac{-b}{2a}$ now, plugging into formula to get:
$\frac{-b}{2a}=-\frac{4}{2(1)}=-2$
The second coordinate of the vertex is $z(-2)=1(-2)^2+4(-2)-3$
$=-7$
Therefore, the vertex of the graph of f is $(-2,-7)$