4.

Solution

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

$u(y)=ay^2+by+c$ where a, b, and c are real numbers and $a\neq 0$

we have $u(y)=y^2-2y+19$, note: $y^2-2y+19$ is in yu-plane

Here, we know that $a=1$, $b=-2$, $c=19$

Since $a>0$,we know that the u-coordinate of the vertex is a minimum. However,to find the u-coordinate of our vertex we first need to find the y-coordinate of the vertex by using $y=-\frac{b}{2a}=-\frac{-2}{2}=1$ Now that we have the y-coordinate, we can find the u-coordinate of the vertex by finding $u(1)=1(1)^2-2(1)+19=1-2+19=18$ Minimum=18