

1.

Solution

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

$$z(w) = aw^2 + bw + c \quad \text{where } a, b, \text{ and } c \text{ are real numbers and } a \neq 0$$

we have $z(w) = -w^2 - 13w + 22$, note: $-w^2 - 13w + 22$ is in wz -plane

Here, we know that $a = -1$, $b = -13$, $c = 22$

Since $a < 0$, we know that the z -coordinate of the vertex is a maximum. However, to find the z -coordinate of our vertex we first need to find the w -coordinate of the vertex by using $w = -\frac{b}{2a} = -\frac{-13}{-2} = -\frac{13}{2}$. Now that we have the w -coordinate, we can find the z -coordinate

of the vertex by finding $z\left(-\frac{13}{2}\right) = -1\left(-\frac{13}{2}\right)^2 - 13\left(-\frac{13}{2}\right) + 22 = -\frac{169}{4} + \frac{169}{2} + 22 = \frac{257}{4}$ Maximum = $\frac{257}{4}$