4.

Solution

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

$k(j) = aj^2 + bj + c$ where a, b, and c are real numbers and $a \neq 0$

we have $k(j) = -3j^2 - 11j - 3$, note: $-3j^2 - 11j - 3$ is in jk-plane

Here, we know that $a = -3$, $b = -11$, $c = -3$

Since $a < 0$, we know that the k-coordinate of the vertex is a maximum. However, to find the k-coordinate of our vertex we first need to find the j-coordinate of the vertex by using $j = -\frac{b}{2a} = -\frac{-11}{-6} = -\frac{11}{6}$ Now that we have the j-coordinate, we can find the k-coordinate

of the vertex by finding $k\left(-\frac{11}{6}\right) = -3\left(-\frac{11}{6}\right)^2 - 11\left(-\frac{11}{6}\right) - 3 = -\frac{121}{12} + \frac{121}{6} - 3 = \frac{85}{12}$ Maximum $= \frac{85}{12}$