1.

It so happens that this function can be simplified as:

$v(k) = \frac{-125+k^3}{-20-k+k^2}$

$= \frac{(k-5)\left(k^2+5k+25\right)}{(k-5)(k+4)}$

$= \frac{k^2+5k+25}{k+4}$

To find the vertical asymptote :

$k + 4 = 0$

$k = -4$

There is a vertical asymptote at $k = -4$

To find the horizontal asymptote :

First we must compare the degrees of the polynomials.

The numerator contains a 3^{rd} degree polynomial while the denominator contains a 2^{nd} degree polynomial.

Since the polynomial in the numerator is a higher degree than the denominator, there is no horizontal asymptote.

To find the oblique asymptote :

we must divide the numerator by the denominator $\frac{-125+k^3}{-20-k+k^2} = \frac{k^2+5k+25}{k+4} = \frac{21}{k+4} + (k+1)$

There is an oblique asymptote at $e = k + 1$