

4.

To find the vertical asymptote :

We must set the denominator equal to 0 and solve:

$$r^4 - 81 = 0$$

$$(r^2 - 9)(r^2 + 9) = 0$$

$$(r^2 - 9) = 0$$

$$(r - 3)(r + 3) = 0$$

$$r = 3 \text{ or } r = -3$$

There is vertical asymptote at  $r = 3$  and at  $r = -3$

To find the horizontal asymptote :

First we must compare the degrees of the polynomials.

The numerator contains a 3<sup>rd</sup> degree polynomial while the denominator contains a 4<sup>th</sup> degree polynomial.

Since the polynomial in the numerator is a lower degree than the denominator, the horizontal asymptote is located at  $h = 0$ .

To find the oblique asymptote :

Since the degrees of the numerator are less than the degrees of the denominator, this rational does not have an oblique asymptote

