

1. Determine whether the following rational function is in simplest form:

$$f(x) = \frac{x(x-3)^2}{x^2(x+3)}.$$

2. Find the zeros and poles of the given function and list the order or multiplicity as well:

$$f(x) = \frac{(x+2)^2(x-2)}{x^3(x+4)}.$$

3. For the following function, list the poles of the function and the order of each pole, the vertical asymptotes of  $f$ , the horizontal asymptote of  $f$ , sketch the denominator of  $f$  and then use inversion to sketch the function:

$$f(x) = \frac{1}{20(x+11)^5(x+6)^3(x-1)^2(x-3)^4(2x-7)^5}.$$

4. List and classify all asymptotes of

$$f(x) = \frac{x^2 - 4}{(x + 9)^2(x - 6)}.$$