

Complete the following for each function on a sheet of graph paper.

1. Find all x intercepts ($f(x) = 0$) and y intercepts ($f(0)$).
2. Find all vertical asymptotes (denominator = 0)
3. Find the end behavior of the function. ($\lim_{x \rightarrow \pm\infty} f(x)$ or horizontal asymptotes)
4. Identify where the function increases, decreases, has critical points and stationary points using the first derivative of the function. Identify these on a sign chart.
5. Identify where the function is concave up, concave down, and has inflection points using the second derivative of the function. Identify these on a sign chart.
6. Sketch a graph of the function including all information you found in #1 – 5.

$$q(x) = x^3 - 3x + 2 = (x + 2)(x - 1)^2 \qquad q''(x) = 6x$$

$$f(x) = \frac{-x}{x^2-4} \qquad f''(x) = \frac{-2x(x^2+12)}{(x^2-4)^3}$$

$$g(x) = \frac{x+4}{x-2} \qquad g''(x) = \frac{12}{(x-2)^3}$$

$$h(x) = (x + 1)^{\frac{2}{3}} \qquad h'(x) = \frac{2}{3(x+1)^{\frac{1}{3}}} \qquad h''(x) = \frac{-2}{9(x+1)^{\frac{4}{3}}}$$

$$w(x) = 6x^{\frac{1}{3}} - 2x^{\frac{4}{3}} \qquad w'(x) = \frac{-8x+6}{3x^{\frac{2}{3}}} \qquad w''(x) = \frac{-8x-36}{9x^{\frac{5}{3}}}$$