

Applied Calculus – Quiz 6

(Attach a sheet of paper showing your work if needed.)

1. Find all relative extrema of $f(x) = x^3 + 15x^2$. Use the first or second derivative test to determine the nature of each extremum.

2. Sketch a graph of $y = f(x)$, a polynomial function satisfying all of the following:

$$f(-4) = 3, \quad f'(-4) = 0, \quad f''(-4) < 0,$$

$$f(0) = -3, \quad f'(0) = 0, \quad f''(0) > 0,$$

$$f(3) = 2, \quad f'(3) = 0, \quad f''(3) < 0,$$

$$f(-2) = 0, \quad f''(-2) = 0,$$

$$f(1) = 0, \quad f''(1) = 0.$$

3. Find each of the following limits, if it exists.

(a) $\lim_{x \rightarrow \infty} \frac{5 - 3x^2}{1 + 2x^2} =$

(b) $\lim_{x \rightarrow \infty} \frac{1 + 4x - x^2}{x^3 - 5} =$

4. Suppose $f(x) = \frac{1}{x^2 - 4}$. Find the following:

(a) vertical asymptote(s) for the graph of $y = f(x)$

(b) horizontal asymptote for the graph of $y = f(x)$

(c) interval(s) where $f(x)$ is increasing

(d) interval(s) where $f(x)$ is concave up.

(e) Graph $y = f(x)$.