

This is only a practice exam. It does not cover all the material that can be asked on the exam. Make sure you can do all the problems from the quizzes and lecture notes.

1. Find the derivative for each of the following functions. **DO NOT SIMPLIFY**

(a) $f(x) = \frac{1}{x^2} - \frac{2}{x} + 2x + 5$ $f'(x) =$ _____

(b) $f(x) = 2\sqrt{x} + 5x^{10} + \frac{3}{x^2}$ $f'(x) =$ _____

(c) $f(x) = 5^2$ $f'(x) =$ _____

(d) $f(x) = \frac{2x^3 + 3x^2}{2x + 3}$ $f'(x) =$ _____

(e) $f(x) = (5x^2 + 2)(3x + x^3)$ $f'(x) =$ _____

(f) $f(x) = (2x^3 + x^2 + 2)^{20}$ $f'(x) =$ _____

(g) $f(x) = x^2(x^4 + 1)^{10}$ $f'(x) =$ _____

(h) $f(x) = \frac{(x^2 + 1)^3}{(x^2 - 1)^2}$ $f'(x) =$ _____

2. Given the function $h(x) = 3x^3 + 18x^2 + 7$, find the critical numbers (just the x -value).

3. Given that $f(x) = 2x^3 - 3x^2$ has critical numbers $x = 0$ and $x = 1$, find the

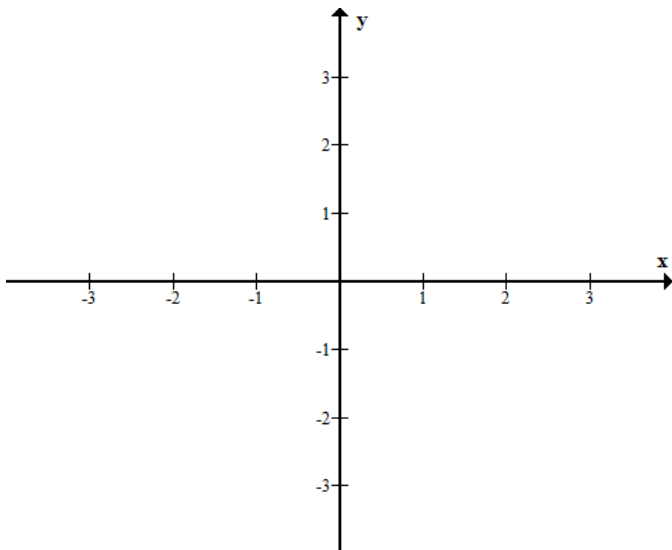
(a) relative maximum and relative minimum (if they exist).

(b) intervals of increasing / decreasing

(c) Inflection Points

(d) Intervals of concavity

(e) Sketch the graph



4. Find the limit, if it exists

(a) $\lim_{x \rightarrow \infty} \frac{x^4 + 3x^2}{2x^5 + x + 7}$

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

(c) $\lim_{x \rightarrow \infty} \frac{x}{x + 4}$

(d) $\lim_{x \rightarrow 2^+} \frac{1}{x - 2}$

5. Sketch the graph of a function having the given properties:

(a) $f(2) = 2$

(b) $f'(2) = 0$

(c) $f'(x) > 0$ on $(-\infty, 2)$

(d) $f'(x) > 0$ on $(2, \infty)$

(e) $f''(x) < 0$ on $(-\infty, 2)$

(f) $f''(x) > 0$ on $(2, \infty)$

6. Let $f(x) = \frac{x-1}{x-2}$, $f'(x) = \frac{-1}{(x-2)^2}$, and $f''(x) = \frac{2}{(x-2)^3}$

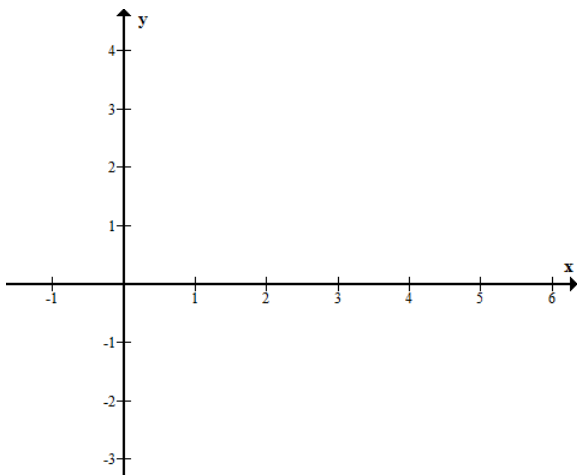
(a) Find the vertical asymptote

(b) Find the horizontal asymptote

(c) Find the intervals where $f(x)$ is increasing or decreasing

(d) Find the interval where $f(x)$ is concave up or down.

(e) Draw a rough sketch of the graph using ALL of the above information.



7. Suppose that $P(x) = -0.01x^2 + 60x - 500$ is the profit function from the manufacture and sale of telephones.
- (a) What is the profit when you manufacture and sell 100 telephones?
- (b) Is profit increasing or decreasing when 100 telephones have been sold? What is $P'(100)$.
- (c) Assuming you've manufactured and sold 100 telephones, should you manufacture and sell the 101st telephone? Explain.
- (d) If you manufactured and sold 100 telephones, estimate the profit after manufacturing and selling the 101st telephone. Use only (a) and (b). What is the actual profit after selling 101 telephones?
- (e) Repeat (a) - (d) for when you manufacture and sell 4000 telephones estimating the profit after selling the 4001st phone.