

TEST 3

Math 111 - 2,4

You have 1 hour to complete the test. You may not use a calculator. Show all relevant work and make your work neat (or else no credit). Use the back of these pages if necessary.

Name _____

1. (12 points) True or false, circle the correct answer:

T F We can apply the mean value theorem to the function $|x|$ on the interval $[-1, 4]$.

T F If $f''(2) = -\sqrt{2}$ then there is a local maximum at 2.

T F Local maximums are always global maximums.

T F Global maximums are always local maximums.

T F If $f'(x) = h'(x)$ then $f(x) = h(x)$.

2. (15 points) Find the limits:

(a)
$$\lim_{x \rightarrow \infty} \frac{4x^3 - 2x\sqrt{x} - 1}{6x^3 - \sqrt{x}}$$

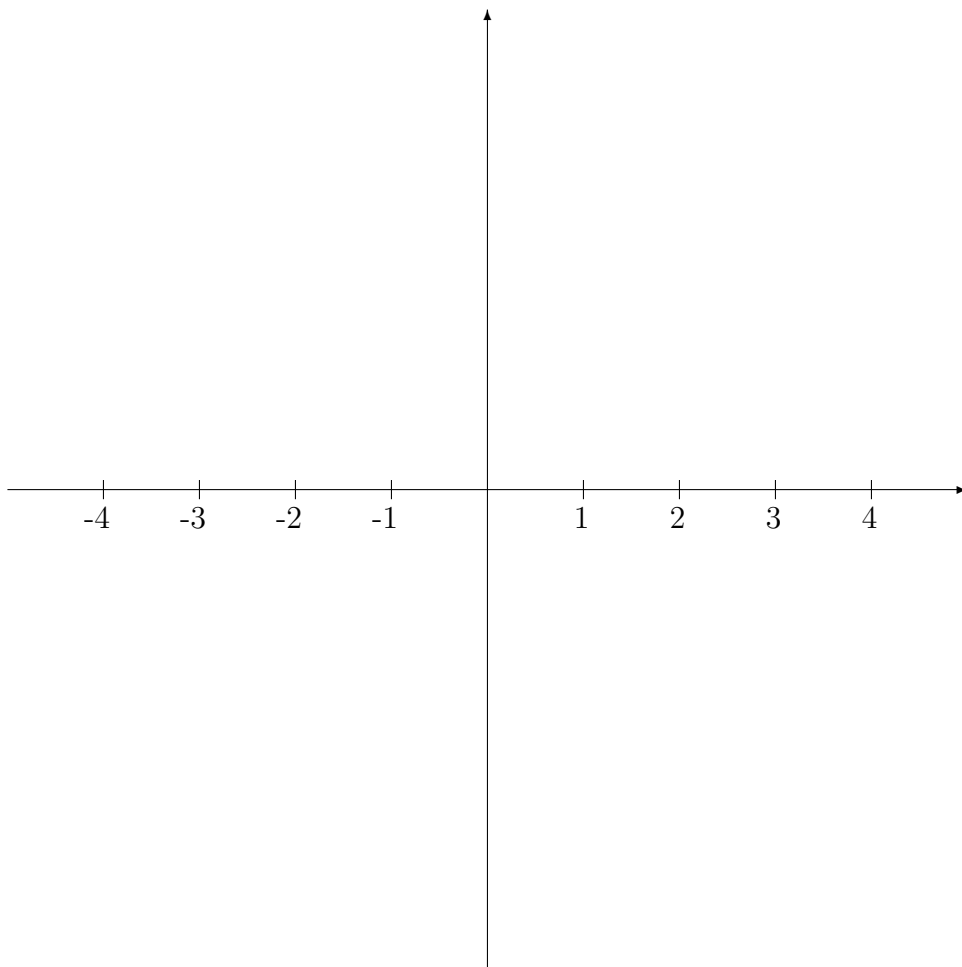
(b)
$$\lim_{t \rightarrow 3^+} \frac{3 + t}{3 - t}$$

(c)
$$\lim_{a \rightarrow \infty} \frac{\sin x^2 \cos x^2}{x^2}$$

3. (15 points) Can the Mean Value Theorem be applied to the function $f(x) = \sqrt{x}$ on the interval $[4,36]$? If so, find the point c in the theorem.
4. (20 points) You draw a rectangle with two corners on the x -axis and the other two on the parabola $y = 15 - 3x^2$, with $y \geq 0$. What are the dimensions of the rectangle of this type with maximum area? (Hint: draw the picture)

5. (20 points) The following is a graph of f' . Answer the following questions about f and draw a possible graph of f .

- (a) Where is f increasing?
- (b) Where is f decreasing?
- (c) Where are the local maximums of f ?
- (d) Where are the local minimums of f ?
- (e) Where is f concave up?
- (f) Where is f concave down?
- (g) Where are the inflection points of f ?



6. (20 points) Graph the following function labeling all of the following (if any): local extremum (x and y values), inflection points (x and y values) and asymptotes.

$$g(x) = \frac{x}{x^2 + 1}$$

