

Name: _____

I pledge that I have neither given nor received any unauthorized assistance on this exam.

(signature)

DIRECTIONS

- 1) Print your name and sign the honor pledge above. If the pledge is not signed, your exam will **not** be graded.
- 2) Check now that your test contains all **6 pages** and **9 problems**.
- 3) You may use a calculator (except symbolic manipulators such as a TI-89, TI-92, or similar), but your answers must be given in their **exact** form. (i.e. $\sqrt{3}$ and not 1.73, π and not 3.14)
- 4) All work must be shown on this exam. **No credit will be given for a correct answer without supporting work that leads to the answer.** When it is indicated that calculators are not to be used, clear non-calculator work must be shown.
- 5) Place a box around **all** of your final answers. Include units when necessary.
- 6) Notation and clarity count. Your job is to communicate mathematically; make what you are thinking clear.
- 7) Work quickly but thoroughly through the test. If you get stuck on a problem, move on to the next and return to it later after you've completed the problems you know how to do. **Good Luck.**

(5) 1. Let $g(x) = \begin{cases} \frac{1-\cos x}{x} & x \neq 0 \\ c & x = 0 \end{cases}$ For what value of c is $g(x)$ continuous at 0? Explain.

(10) 2. Write the equations for the horizontal asymptotes of the graph of $f(x) = \frac{x-3}{\sqrt{3x^2+1}}$

(6 each) 3. Calculate the following limits (if they exist) or state **why** it does not exist.

$$(a) \lim_{t \rightarrow -2} \frac{t^2 - 3t - 10}{t^2 - 4}$$

$$(b) \lim_{x \rightarrow 1} \frac{|x - 1|}{x - 1}$$

$$(c) \lim_{\theta \rightarrow 0} \frac{\pi\theta \cos(3\theta)}{\sin(4\theta)}$$

$$(d) \lim_{x \rightarrow 3^+} \frac{x^2 - 7x + 10}{x^2 - 9}$$

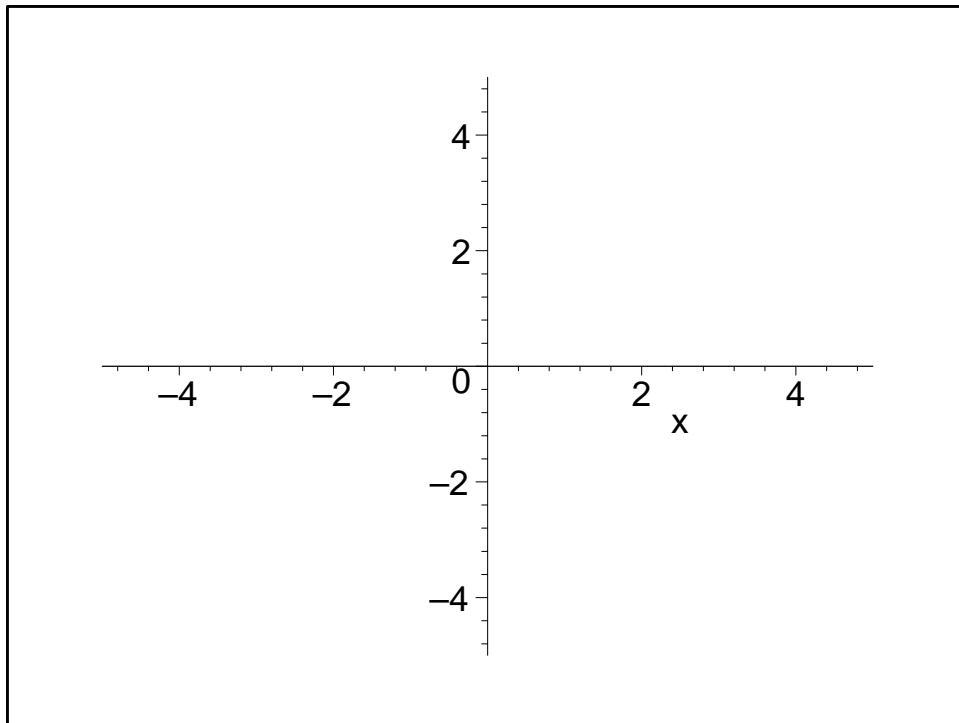
(10) 4. Sketch the graph of a function $f(x)$ satisfying all of the following:

A. $\lim_{x \rightarrow \infty} f(x) = 2$

B. $\lim_{x \rightarrow -\infty} f(x) = -4$

C. $f(0) = 1$ and $f'(0) = 0$

D. $\lim_{x \rightarrow 1} f(x) = -1$, but f is not continuous at 1



(12) 5. Write the equation of the tangent line to the graph of $f(x) = \frac{x^2}{x+4}$ at the point $(2, \frac{2}{3})$.

(5 each) 6. (a) State the limit definition of $f'(x)$.

(b) Use the limit definition to compute $f'(x)$ for $f(x) = \sqrt{8x + 3}$.
You **must** use the limit definition for this; using any other method will result in zero credit.

(5) 7. Use the Intermediate Value Theorem to show that $f(x) = -3 \sin^2 x - 5x + 6$ has a root in the interval $[0, \pi]$. Do not actually find this root!

(6 each) 8. Find $D_x y$ for the following y .

(a) $y = (3x^2 + 2x^{-3}) \cdot (\frac{4}{x} - 3x^4)$

(b) $y = 3\pi^2 x - 4x^3$

(6 each) 9. Suppose an arrow is shot upward with velocity of 58 m/s, and its height in meters after t seconds given by $h(t) = 58t - .83t^2$.

(a) Find the average velocity of the arrow between 1 and 3 seconds.

(b) Find the instantaneous velocity when the arrow lands ($h(t) = 0$).