

EXAM 3
Math 131
November 3, 2006

Name _____

You must show all your work. Partial credit will be given.

1. Find each of the following limits. (9 pts each)

(a) $\lim_{x \rightarrow 0} \frac{e^{2x} - 1}{x}$

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

(c) $\lim_{x \rightarrow \infty} \sqrt{x^2 + 1} - x$

(d) $\lim_{x \rightarrow 0} x \sin \frac{1}{x}$

2. Find the linear approximation of $f(x) = \sin(3x)$ at $x_o = 0$. (8 pts)

3. Use Newton's method and $x_o = 1$ to calculate a root of $f(x) = x^4 - 3x^2 + 1$. (Accurate to at least 6 decimal places.) (8 pts)

4. Find all the positive values of x which cause $\sin(x) = x^2 - 1$. (You must use Newton's method and obtain at least 4 decimals of accuracy.) (8 pts)

5. Prove that $x^4 + 6x^2 - 1 = 0$ has exactly two solutions. (8 pts)

6. Find the absolute extrema of $f(x) = x \sin(x) + 3$ on the interval $[0, 2\pi]$. (8 pts)

7. Find all the critical numbers for $f(x) = x^3 - 3x^2 + 3x$. (8 pts)

8. Find all relative max/min values for the function $f(t) = t^2e^{-t}$. (8 pts)

9. Suppose $f(x)$ is a function which satisfies all of the following conditions: $f(3) = 0$, $f'(x) < 0$ for $x < 0$ and $x > 3$, $f'(x) > 0$ for $0 < x < 3$, $f'(0)$ does not exist, $\lim_{x \rightarrow \infty} f(x) = 4$ and $\lim_{x \rightarrow -\infty} f(x) = \infty$. Sketch a possible graph of this function on the axes below. (8 pts)

