

## **HOMEWORK ASSIGNMENT #8**

due in class on Friday, November 22

Student No: \_\_\_\_\_ Name (Print): \_\_\_\_\_

Note: All homework assignments are due in class one week after being assigned. They must be on standard  $8\frac{1}{2} \times 11$  size paper and they must be stapled. Assignments which are not stapled will not be accepted. I will not bring a stapler to class. Please enter your student number and name (as it appears on the registrar's list) in the spaces above. SURNAME FIRST IN CAPITALS, and given name second. Please put your answers in the boxes (if provided) and submit these pages for your assignment.

1. Graph the following functions showing all work:

(a)  $f(x) = \frac{x^2}{x - 1}$ .

(b)  $f(x) = e^{-x^2}$ ,  $-\infty < x < \infty$ .

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(c)  $f(x) = xe^{-x}$ ,  $-\infty < x < \infty$ .

(d)  $f(x) = x^2 e^{-|x|}$ .

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2. Compute the following limits:

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

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(b)  $\lim_{x \rightarrow 0} \frac{\sin(x) \sin(2x)}{x^2 + x^4}$

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(c)  $\lim_{x \rightarrow 0} \frac{\ln(1 + x)}{x}$

3. Find the Maclaurin series (Taylor series at  $x = 0$ ) for the following functions:

(a)  $f(x) = \ln(1 + x^2)$

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(b)  $f(x) = \frac{1 - e^{-x}}{x}$

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(c)  $f(x) = \tan x$  out to and including terms of order 5.

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(d)  $f(x) = e^{\sin x}$  out to and including terms of order 3.

4. Suppose  $f(x)$  is a function satisfying  $f(0) = 10$  and  $f'(x) = \frac{1}{1+x^4}$  for all  $x$ . Compute the linear approximation  $L$  to  $f(0.1)$  and show that  $L - 2 \times 10^{-5} < f(0.1) < L$ .

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5. Suppose  $f(x)$  is a function which is twice differentiable for  $-\infty < x < \infty$  and satisfies  $f(0) = f(1) = f(2) = 0$ . Show that there exists  $x$  such that  $0 < x < 2$  and  $f''(x) = 0$ .