

Name _____

TA: _____

Section: _____

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- Your exam contains 5 problems. The entire exam is worth 55 points.
 - You have 80 minutes to complete this exam.
 - This exam is closed book. You may use one $8\frac{1}{2}'' \times 11''$ sheet of notes (both sides). Do not share notes.
 - The only calculator allowed is the TI 30x IIS.
 - In order to receive credit, you must **show all of your work**. If you do not indicate the way in which you solved a problem, you may get little or no credit for it, even if your answer is correct.
 - Place a box around your answer to each question.
 - If you need more room, use the backs of the pages and indicate that you have done so.
 - Raise your hand if you have a question.
 - This exam has 7 pages, including this cover sheet. Please make sure that your exam is complete.

Problem #1(15 pts) _____

Problem #2(10 pts) _____

Problem #3(14 pts) _____

Problem #4(9 pts) _____

Problem #5(7 pts) _____

TOTAL (55 pts) _____

1. Calculate the following limits. Your answer should be either a number or $+\infty$, $-\infty$, or DNE (does not exist). Make sure to justify all steps (a table of values is not a proper justification).

(a) $\lim_{x \rightarrow 2} \frac{x+5}{|2-x|} \sin x$

(b) $\lim_{x \rightarrow +\infty} \frac{\sqrt{7+x^2}}{2-x}$

(c) $\lim_{x \rightarrow 2} \frac{3 - \sqrt{7+x}}{2-x}$

2. (a) Compute $g''(2)$, where $g(x) = e^x \cdot x^e$:

(b) $f(x) = \cos(\sqrt{x})$. Use the definition of derivative to fill in the blanks:

$$f'(4) = \lim_{h \rightarrow \boxed{}} \frac{\cos \boxed{} - \cos \boxed{}}{h}. \text{ Do not calculate the limit.}$$

3. The position with respect to a certain origin O of a certain object, is given by $s(t) = \frac{t^2+10}{t^5+2}$. t is measured in minutes, $s(t)$ in feet.

(a) Find the distance of the object from O at time $t = 0$.

(b) Is it True or False that the object will never be closer than 0.2 feet to O ? Justify your answer. You can assume the object keeps moving forever.

(CONTINUED FROM PREVIOUS PAGE)

(c) Find the instantaneous velocity $v(t)$. Simplifying your answer may help you solve part d).

(d) Find $\lim_{t \rightarrow \infty} v(t)$

4. (a) Suppose $f(x)$ is the function defined below :

$$f(x) = \begin{cases} \frac{\cos x}{4a}, & \text{if } x \leq 0 \\ \frac{a \sin x}{x}, & \text{if } x > 0 \end{cases}$$

(a) Determine all values of a that make f continuous at $x = 0$.

(b) If $a = 12$ is f differentiable at $x = 0$? Justify your answer.

5. For which values of the parameter a is the tangent line to the curve $y = \sqrt{x} + 3x$ at $P = (4, 14)$ parallel to $y = ax + 7$? Show your work.