

Calculus with applications I

Math 3A, Winter 2010

Instructor: Sookyung Joo

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Answer the following 6 questions. Show all your work for full credit. Correct answers with inconsistent work may not be given credit.

Name: _____

Perm number: _____

TA's name: _____

Problem 1: _____ out of 10.

Problem 2: _____ out of 10.

Problem 3: _____ out of 10.

Problem 4: _____ out of 10.

Problem 5: _____ out of 10.

Problem 6: _____ out of 10.

Total: _____ out of 60.

1. (10 points) Determine each limit.

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

(b) $\lim_{t \rightarrow 0} \frac{1}{t} \left(\frac{1}{\sqrt{1-t}} - 1 \right)$

(a)

(b)

2. (10 points) Determine the values of a and b that make the given function continuous in the domain of f .

$$f(x) = \begin{cases} x - 1 & \text{if } x \leq 1 - e \\ \ln(1 - x) + a & \text{if } 1 - e < x < 0 \\ b \cos^{-1}\left(\frac{x}{100}\right) & \text{if } 0 \leq x \leq 100 \end{cases}$$

$a =$

$b =$

3. (10 points) Find the horizontal and vertical asymptotes of $y = \frac{3x^2 - 1}{x^2 - 5x - 6}$. Justify your answer.

horizontal asymptote(s)

vertical asymptote(s)

4. (10 points) Find the derivatives of the function $g(t) = \sqrt{3t - 1}$ using the definition of derivative. State the domain of the function and the domain of its derivative.

5. (10 points) Find the first and the second derivatives of

$$f(x) = -x^5 + 2x\sqrt{x} + xe^x - \frac{3}{x} + 4\frac{1}{\sqrt{x}} + \pi x.$$

$f'(x) =$

$f''(x) =$

6. (10 points) Find the tangent line equation to the curve $f(x) = \frac{e^x}{x+1}$ at $x = 1$.