Exam 3 **Name**_____

Math 131-01 **Calculus I** **November 5, 2018**

Guidelines

- **Calculators are not allowed.**
- Read the questions carefully. You have 50 minutes; use your time wisely.
- You may leave your answers in symbolic form, like $\sqrt{3}$ or $\ln(2)$, unless they simplify further like $\sqrt{9} = 3$ or $\cos(3\pi/4) = -\sqrt{2}/2$.
- Put a box around your final answers when relevant.
- Show all steps in your solutions and make your reasoning clear. Answers with no explanation will not receive full credit, even when correct.
- Use the space provided. If necessary, write âĂIJsee other sideâĂİ and continue working on the back of the same page.

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1. (8 points) To be completed once exams are graded and returned. Please correct any problem with points deducted. All corrections should be completed neatly on a separate sheet of paper. Once you have finished your corrections, take your exam and corrections to the Office of Student Learning (OSL), and a tutor will check your answers and sign below. The checked solutions should be given to your instructor.

   Signature: _____
   Print Name: _____
   Date: _____

Question	Points	Score
1	8	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
Total:	98	

2. (10 points) Evaluate $\lim_{x \to \pi/2} \dfrac{2x - \pi}{\cos(2\pi - x)}$.

3. (10 points) Evaluate $\lim_{x \to 0} \dfrac{5 - 5\cos x}{e^x - x - 1}$.

4. (10 points) Evaluate $\lim_{x \to 0^+} \left(1 + \dfrac{2}{x}\right)^{3x}$.

5. (10 points) Verify the function, $f(x) = x^3 - 3x + 2$ on $[-2, 2]$ satisfies the hypotheses of the Mean Value Theorem. Then find all numbers c that satisfy the conclusion of the Mean Value Theorem.

6. (10 points) Given $f(x) = x^4 - 2x^2 + 3$, find intervals of increase and decrease for the function. Label each critical point as local maximum, local minimum or neither.

7. (10 points) Suppose $f'(x) = \dfrac{2x}{x^2+9}$ for a function with domain $(-\infty, \infty)$. Determine intervals where the function is concave up and concave down. Also identify any points of inflection.

8. (10 points) Find the absolute maximum and minimum for $f(x) = x + \dfrac{1}{x}$ on $\left[\dfrac{2}{10}, 4\right]$.

9. (10 points) Sketch a graph of a **continuous** function on $\mathbb{R}$ that satisfies the following conditions:

   a. $f'(0) = f'(4) = 0$, $f'(-1)$ and $f'(2)$ are undefined.

   b. $f'(x) = 1$ for $x < -1$; $f'(x) > 0$ for $0 < x < 2$; $f'(x) < 0$ for $-1 < x < 0$, or $2 < x < 4$ or $x > 4$

   c. $f''(x) < 0$ for $x > 4$; $f''(x) > 0$ for $-1 < x < 2$ and $2 < x < 4$

10. (10 points) A rain gutter is made from sheets of metal 9 inches wide. The gutters have a 3 inch base and two 3 inch sides, folded at an angle, see figure below. What angle maximizes the cross-sectional area of the gutter?