University of California, San Diego
Department of Mathematics

Instructions

1. **Write your *Name*, *PID*, *Section*, and *Exam Version* on the front of your Blue Book.**
2. **No calculators or other electronic devices are allowed during this exam.**
3. **You may use one page of notes, but no books or other assistance during this exam.**
4. **Read each question carefully, and answer each question completely.**
5. **Write your solutions clearly in your Blue Book.**
   (a) **Carefully indicate the number and letter of each question and question part.**
   (b) **Present your answers in the same order they appear in the exam.**
   (c) **Start each problem on a new page.**
6. **Show all of your work. No credit will be given for unsupported answers, even if correct.**
7. **Turn in your exam paper with your Blue Book.**
8. **Do not use l'Hôpital's Rule anywhere on this exam.**

---

0. (1 point) Carefully read and complete the instructions at the top of this exam sheet and any additional instructions written on the chalkboard during the exam.

1. (5 points) Define a function f by the following formula:

$$f(x) = \begin{cases} -2 & \text{if } x < -1 \\ 4 & \text{if } x = -1 \\ x^2 + 3 & \text{if } -1 < x < 1 \\ ax & \text{if } x \geq 1 \end{cases}$$

   (a) Compute $\lim_{x \to -1} f(x)$ or explain why it does not exist.

   (b) Compute $\lim_{x \to 0} f(x)$ or explain why it does not exist.

   (c) Is f left continuous at $x = -1$?

   (d) Is f right continuous at $x = -1$?

   (e) Find the value of a that make the function f continuous at $x = 1$.

2. (10 points) Compute the following limits or state why they do not exist:

   (a) $\lim_{x \to 0} \dfrac{\sin(2x)\sin(7x)}{x^2}$ (b) $\lim_{x \to 0} \dfrac{5}{\sqrt{5x+1}+1}$ (c) $\lim_{h \to 0} \dfrac{\sqrt{9h+4}-2}{h}$

3. (10 points) Compute the following derivatives:

   (a) $f(x) = x^{5/4} - x^e$ (b) $g(x) = 4xe^x - 1$ (c) $h(x) = \dfrac{e^3}{x^2 - 4}$

4. (9 points) Let $f(x) = \dfrac{2x+5}{3x-2}$. Find the equation of the tangent line to the graph of f at the point $(2, f(2))$.

(This exam is worth 35 points.)