
Exam #1: APPM 1350 - Spring 2005.

ON THE FRONT OF YOUR BLUEBOOK please write: (1) your name, (2) your student ID, (3) your section and lecturer name (010-Carvalho or 020-Lladser). You must work all the problems on the exam. Show all your work in your bluebook and **BOX IN YOUR FINAL ANSWERS**. A correct answer with no relevant work may receive no credit, while an incorrect answer accompanied by some correct work may receive partial credit. Text books, class notes, and calculators are not permitted.

P1. (32 points.) Find the requested limits, if they exist. Justify all your answers.

- (a) $\lim_{x \rightarrow 1} \frac{\sqrt{x+3} - 2}{x-1}$
- (b) $\lim_{x \rightarrow 2^-} \frac{|x-2|}{x-2}$
- (c) $\lim_{x \rightarrow (-5)^-} \frac{3x}{2x+10}$
- (d) $\lim_{x \rightarrow 0^+} x \cdot \cos\left(\frac{1}{x^2}\right)$

P2. (23 points.) Find the requested information.

- (a) State the definition of $\frac{df(x)}{dx}$.
- (b) Use the definition above to calculate $\frac{df(x)}{dx}$ when $f(x) = \frac{1}{x-1}$.
- (c) Find the equation of the tangent line to $f(x)$ at $x = 2$.

P3. (23 points.) Consider the function $f(x) = \begin{cases} 2x & , x \leq 1 \\ x^2 + x & , x > 1 \end{cases}$.

- (a) Is $f(x)$ continuous at $x = 1$? Justify using the definition of continuity at a point.
- (b) Does $\lim_{h \rightarrow 0} \frac{f(1+h) - f(1)}{h}$ exist? If YES, compute its value. If NOT, explain why.
- (c) Is $f(x)$ differentiable at $x = 1$? Justify.

P4. (22 points.) Consider the functions

$$\begin{aligned} f(x) &= x^5 + \sin(x) + 3, \\ g(x) &= x^2 + \cos(x) + 3. \end{aligned}$$

- (a) Is $f(x)$ even, odd or neither? Justify.
- (b) Is $g(x)$ even, odd or neither? Justify.
- (c) Does the equation $f(x) = 0$ have a real solution? Justify.
- (d) Does the equation $g(x) = 0$ have a real solution? Justify.