

---

**Exam #2: 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.** (30 points) Find the requested information.

- (a) Let  $f(x) = (x^2 + 1 + x^{-2}) \tan(x)$ . Find  $f'(x)$ .
- (b) Let  $g(t) = \frac{2t + 1}{t^2 - 1}$ . Find  $g'(t)$ .
- (c) Let  $2y^{1/4} = x^2 - y$ . Find  $\frac{dy}{dx}$ .
- (d) Let  $h(t) = \cos(\sqrt{1 + \sqrt{t}})$ . Find  $h'(t)$ .
- (e) Compute  $\lim_{x \rightarrow \infty} \frac{x - \sin(2x)}{x + \sin(3x)}$ , if it exists. Make sure to justify your answer.
- (f) Compute  $\lim_{t \rightarrow 0} \frac{t - \sin(2t)}{t + \sin(3t)}$ , if it exists. Make sure to justify your answer.

**P2.** (20 points) Are there numbers  $a$  and  $b$  that will make the function

$$f(x) = \begin{cases} ax + b & , \text{ for } x < \pi \\ \sin(x) & , \text{ for } x \geq \pi \end{cases}$$

differentiable at  $x = \pi$ ? If yes, state their values. Be sure to show your work and justify your answer.

**P3.** (20 points) A 15-ft ladder is leaning against a house on a flat terrain (with the house to the left of the ladder). Suddenly, the base of the ladder starts to slide away from the house. By the time the base is 12 ft from the house, it is moving horizontally at the rate of 3 ft/sec. (Keep in mind that the top of the ladder is in contact with the house at all times.)

- (a) How fast is the top of the ladder sliding down the wall when the base is 12 ft from the house?
- (b) At what rate is the angle between the ladder and the ground changing when the base is 12 ft from the house?

**(ONE MORE PROBLEM ON THE BACK)**

**P4.** (30 points) Consider the function  $f(x) = \frac{x^3 + 1}{x^2}$ .

- (a) Is  $f(x)$  even, odd or neither? Justify.
- (b) Does  $f(x)$  have an oblique asymptote? If so, what is it?
- (c) Does  $f(x)$  have a horizontal asymptote? If so, what is it?
- (d) Does  $f(x)$  have a vertical asymptote? If so, what is it?
- (e) Find  $f'(x)$ .
- (f) In which interval(s) is  $f(x)$  increasing?
- (g) In which interval(s) is  $f(x)$  decreasing?
- (h) Find  $f''(x)$ .
- (i) In which interval(s) is  $f(x)$  concave up?
- (j) In which interval(s) is  $f(x)$  concave down?
- (k) Does  $f(x)$  have a cusp? If so, state whether it is a local max or a local min and where it happens.