

80 pts. **Problem 1.** In each part, find the derivative of the given function. After eliminating all the derivatives, it is not necessary to simplify your answer.

A. $f(x) = 10x^8 - 5x^6 + 3x^2 + 7x - 34$

B. $f(x) = \frac{x^2 + 3}{5x + 2}$

C. $f(x) = x^2 \tan(x)$

D. $f(x) = x^2(x^2 + 1)^9$

E. $f(x) = \sin^4(5x)$

F. $f(x) = e^{x^2 - 5x + 2}$

G. $f(x) = x^2 \ln(x)$

H. $f(x) = \sin^{-1}(x^2)$

40 pts. **Problem 2.** Find the slope of the line tangent to the curve

$$x^2 + x^3y + y^3 = 13$$

at the point $(2, 1)$.

40 pts. **Problem 3.** A rope attached to a boat is being pulled in through an eye-bolt on a pier. The eye-bolt is 12 feet above the point where the rope is attached to the boat. The rope is being pulled in at 5 feet per second. How fast is the boat approaching the pier when the rope is 20 feet long?

40 pts. **Problem 4.** The formula for the volume of a sphere of radius r is $V = \frac{4}{3}\pi r^3$. The radius of a sphere is measured to be 10 inches. If there is a possible error of 2% in the measurement of the radius, estimate the possible percentage error in the calculation of the volume.

40 pts. **Problem 5.** In each part, use **logarithmic differentiation** to find dy/dx .

1. $y = \frac{e^x}{x^2(x-1)^5}$.

2. $y = x^{\tan(x)}$.

60 pts.

Problem 6. Alice throws a ball upward with a velocity of 96 feet per second, while standing on a platform 256 feet above the ground. Ignoring air resistance, answer the following questions.

1. How far above the ground is the ball, at its highest point?
 2. What is the total distance travelled by the ball before it hits the ground?
 3. How fast is the ball travelling when it hits the ground?
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EXAM

Exam #3

Math 1351-004, Spring 2003

April 14, 2003

- This is a **Take-Home Exam**, due April 23.
- Write all of your answers on separate sheets of paper. You can keep the exam questions.
- You **must** show enough work to justify your answers. Unless otherwise instructed, give exact answers, not approximations (e.g., $\sqrt{2}$, not 1.414).
- This exam has 6 problems. There are **300 points total**.

Good luck!