

Name: _____

4-digit code: _____

- Write your name and the last 4 digits of your SSN in the space provided above.
- The test has five (5) pages, including this one.
- Enter your answer in the box(es) provided.
- You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
- Credit for each problem is given in parentheses at the right of the problem number.
- No books, notes or calculators may be used on this test.

Page	Max. points	Your points
2	30	
3	20	
4	20	
5	30	
Total	100	

Problem 1 (20 pts). An aircraft is climbing at 30° angle to the horizontal. How fast is the aircraft gaining altitude if its speed is 500 mi/h?

The aircraft is gaining altitude at a speed of

Problem 2 (10 pts). Find an equation of the normal line to the curve $y = \ln(xe^{x^2})$ at the point $(1, 1)$.

Problem 3 (20 pts). Find the absolute extrema of $f(x) = 6x^{4/3} - 3x^{1/3}$ on the interval $[-1, 1]$.

Absolute maxima at

Absolute minima at

Problem 4 (20 pts). Use logarithmic differentiation to find the derivative of the function

$$y = \frac{\sin^2 x \tan^4 x}{(x^2 + 1)^2}$$

$$\frac{dy}{dx} =$$

Problem 5 (30 pts). A box with square base is wider than it is tall. In order to send the box through the U.S. mail, the width of the box and the perimeter of one of the (nonsquare) sides of the box can sum no more than 108 in. What is the maximum volume for such a box?

Maximum volume: