

Score:

Name:

Business Calculus, Summer 2004
Midterm 2

Instructions: This exam should be taken in 1 hour. Calculators and one hand-written page of notes are allowed. Use the back of the page if you need extra space.

1. (20pts.) Find the derivative of

$$f(x) = \frac{xe^{x^2} - \ln 2x}{x^3 + 1}$$

2. (20pts.) A rectangular box with an open top and square bottom is to be formed using just 48 square feet of cardboard. How should the height h and base length l be chosen so as to maximize the volume of the box?

3. (10 pts.) Find the absolute maximum and absolute minimum value of $f(x) = x^2 + \frac{16}{x}$ on the interval $1 \leq x \leq 4$.
4. (10 pts.) Let $f(x) = x^3 + 3x^2 + 5x - 1$. Find the equation of the tangent line to $y = f(x)$ at the point $(1, 8)$.
5. (10 pts.) \$500 invested at an interest rate of r (as a decimal) compounded monthly will grow to $A = 500 \left(1 + \frac{r}{12}\right)^{14}$ after 14 years. Find the instantaneous rate of change of A with respect to r .

6. (15 pts.) Find the critical points of $f(x) = \frac{1}{4}x^4 - x^3 + x^2 - 7$. Then use either the first derivative sign test or the second derivative test to classify them as maxes, mins or “nothing” points.

7. (15 pts.) In high gear a truck has a minimum speed of 10 miles per hour. When travelling x miles per hour in high gear the truck burns gas at the rate of $\frac{1}{3} \left(\frac{900}{x} + x \right)$ gallons per mile. Gas costs \$2 a gallon and the driver is paid \$15 an hour. He has to make a 500 mile trip, but he can never exceed 60 miles per hour. What speed x minimizes the total cost of the trip?