

PRACTICE MIDTERM EXAM II—MATH 251

Time: 3:00pm—3:50pm

Name (print):

Student ID No.:

Signature: :

Grade:

Problem	Points	Grades
No. 1	10	
No. 2	10	
No. 3	10	
No. 4	10	
No. 5	10	

Instructions: To receive full credits, all answers must be supported with clear and correct derivations. **No Credit** will be given for the answer without the detailed correct work.

Date: Oct 26th, 2009.

1. Short answer problems.

(1). Find the derivative of

$$H(z) = \ln \sqrt{\frac{a^2 - z^2}{a^2 + z^2}}.$$

(2). Suppose $g'(x) = 1 - 2g(x) + \cos(3g(x) - 1)$. If $g(1) = \frac{1}{3}$, use linear approximation to estimate $g(1.03)$.

2. Let $f(x) = 2x^3 + 3x^2 - 36x + 2$. Find its critical points, inflection points and the intervals where $f(x)$ is increasing and decreasing. Also find where $f(x)$ is concave up and where $f(x)$ is concave down.

3. A bacteria culture grows with constant relative growth rate. After 2 hours, there are 600 bacteria and after 8 hours the count is 75,000.

- (1) Find the initial population and the relative growth rate.
- (2) Find an expression for the population after t hours.

4. Gravel is dumped from a conveyor belt at a rate of $100 \text{ ft}^3/\text{min}$. It forms a pile in the shape of a right circular cone whose base diameter and height are always the same. How fast is the height of the pile increasing when the pile is 20 ft high?

5. A box with a square base and open top must have a volume of $32,000\text{cm}^3$. Find the dimensions of the box that minimizes the amount of material used.