

Name: _____ PID: _____

TA: _____ Sec. No: _____ Sec. Time: _____

Math 10B.
Final Examination
March 17, 2010

Turn off and put away your cell phone.

You may use any type of calculator, but no other electronic devices during this exam.

You may use one page of notes, but no books or other assistance during this exam.

Read each question carefully, and answer each question completely.

Show all of your work; no credit will be given for unsupported answers.

Write your solutions clearly and legibly; no credit will be given for illegible solutions.

If any question is not clear, ask for clarification.

#	Points	Score
1	12	
2	6	
3	6	
4	6	
5	8	
6	10	
7	8	
Σ	56	

1. (12 points) Find the following indefinite integrals.

(a) $\int \cos(\theta) \sqrt{\sin(\theta) + 2} d\theta$

(b) $\int \frac{u}{u^2 + u} du$

(c) $\int x^2 \ln(2x) dx$

2. (6 points) Find the finite area enclosed by $y = x$ and $y = (2 - x)^2 + 2$.

3. (6 points) Find the volume of the solid that results from revolving about the x -axis the region enclosed by the x -axis and the curve $y = 2 \sin(x)$ for $0 \leq x \leq \pi$.

4. (6 points) Determine the solution to the following initial value problem

$$\begin{cases} \frac{dy}{dx} = y + yx^2 \\ y(0) = 3 \end{cases}$$

5. (8 points) Determine whether each improper integral converges or diverges; if it converges, find its value.

(a) $\int_{-2}^6 \frac{1}{(t+2)^{2/3}} dt$

(b) $\int_{15}^{\infty} \frac{2}{x \ln(x)} dx$

6. A company earns revenue at a continuous annual rate of 0.04 (4%) of its net worth. At the same time, the company's payroll obligations amount to 10 million dollars per year, paid out continuously.

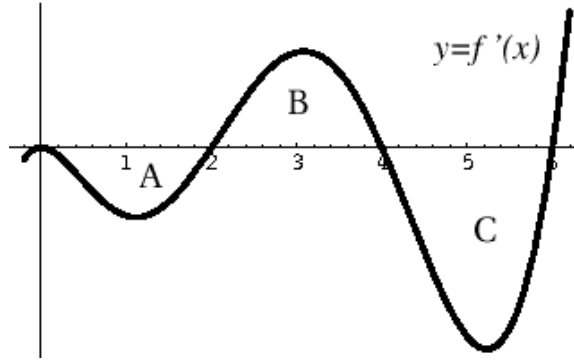
(a) (2 points) Write a differential equation that governs the net worth, W , of the company in millions of dollars.

(b) (2 points) Determine the initial net worth W_0 that will keep the net worth constant; in other words, determine the value of W_0 for which $W = W_0$ is an equilibrium solution of the differential equation.

(c) (4 points) Solve the differential equation given that the initial net worth is $W_0 = 100$.

(d) (2 points) How long will it take for the company to go bankrupt? In other words, how long will it take for the net worth of the company to be zero?

7. Let $f(x)$ be a function satisfying $f(0) = 2$ whose *derivative* is graphed below; the area of region **A** is **3**, the area of region **B** is **4**, and the area of region **C** is **6**.



- (a) (2 points) Find the value of $f(6)$.
- (b) (2 points) Find the average rate of change of f on the interval $[0, 6]$.
- (c) (4 points) Find the absolute (global) maximum value of $f(x)$ on the interval $[0, 6]$, and state where it occurs.