Math 117
Spring 2007

Name: _____

Final Exam - Form B

Instructions:

- You have 1 hour and 48 minutes to complete this exam. It consists of 8 pages including this cover sheet and is worth a total of 150 points. The value of each question is listed with each question.
- You may use **two** 8.5 inch by 11 inch sheets of notes (both sides).
- You may use any standard scientific or graphing calculator which does not have symbolic algebra capabilities.
- If you use the **table of integrals** to solve a problem, identify the number of the integral and all substitutions.
- Please **write clearly** and make sure to **justify your answers.** Correct answers with no supporting work may not receive credit.

Problem	Score
1	
2	
3	
4	
5	
6	
7	
8	
Total	

(1.)(20 pts.) Find the indicated derivatives. You do not need to simplify your answers.

(a.) Find the acceleration $a(t)$ if the position $x(t)$ is given by:

$$x(t) = \cos(5t) + (7t - 8)(2t + 5)$$

(b.) Find $\frac{dy}{dx}$ if:

$$y = \tan^2(x^4) + e^{x^2} + 5$$

(c.) Find y' if:

$$y = \sin^{-1}\left(\frac{x+5}{2x-3}\right)$$

(2.)(30 pts.) Use the following information about $f(x)$ to answer the following questions:

$$f(x) = \frac{(x-2)(x+2)}{(x-5)(x+5)} \qquad f'(x) = \frac{-42x}{(x-5)^2(x+5)^2} \qquad f''(x) = \frac{42(3x^2-25)}{(x-5)^3(x+5)^3}$$

(a.) At which values of x do the absolute maximum and the absolute minimum of $f(x)$ occur on the interval $[-3, 4]$

(b.) On what interval or intervals is the graph of $f(x)$ concave up?

(c.) On what interval or intervals is $f(x)$ decreasing?

(3.)(25 pts.) Evaluate the following integrals:

(a.) $\displaystyle\int 3x^3(5x^4-2)^{50}\,dx$

(b.) $\displaystyle\int \frac{\sin x}{\sqrt{9+\cos^2 x}}\,dx$

(c.) $\displaystyle\int_1^5 (x-3)^{50}\,dx$

(4.)(10 pts.) Use Simpson's rule with $n = 4$ subintervals to estimate the following integral:

$$\int_1^3 \frac{x^2}{\sqrt{x^2+2}}\,dx$$

(5.)(10 pts.) Suppose that a two dimensional lamina of uniform density $\rho = 5$ has the shape given by the region bounded by the curves $y = x^2 + 1$, $y = 0$, $x = 2$ and $x = -1$. Setup, but DO NOT EVALUATE an integral to find:

(a.) The moment M_x of this lamina about the x-axis.

(b.) The moment M_y of this lamina about the y-axis.

(6.)(25 pts.) Suppose that R is the region in the bounded by the curves $y = x^2 + 1$ and $y = 4 - 2x^2$. Set up, but DO NOT EVALUATE an integral to find:

(a.) The area of the region R.

(b.) The volume of the solid whose base is R with cross-sections perpendicular to the x-axis that are semicircles.

(c.) The volume of the solid formed by rotating R about the x-axis.

(7.)(20 pts.) The acceleration of a particle is given by:

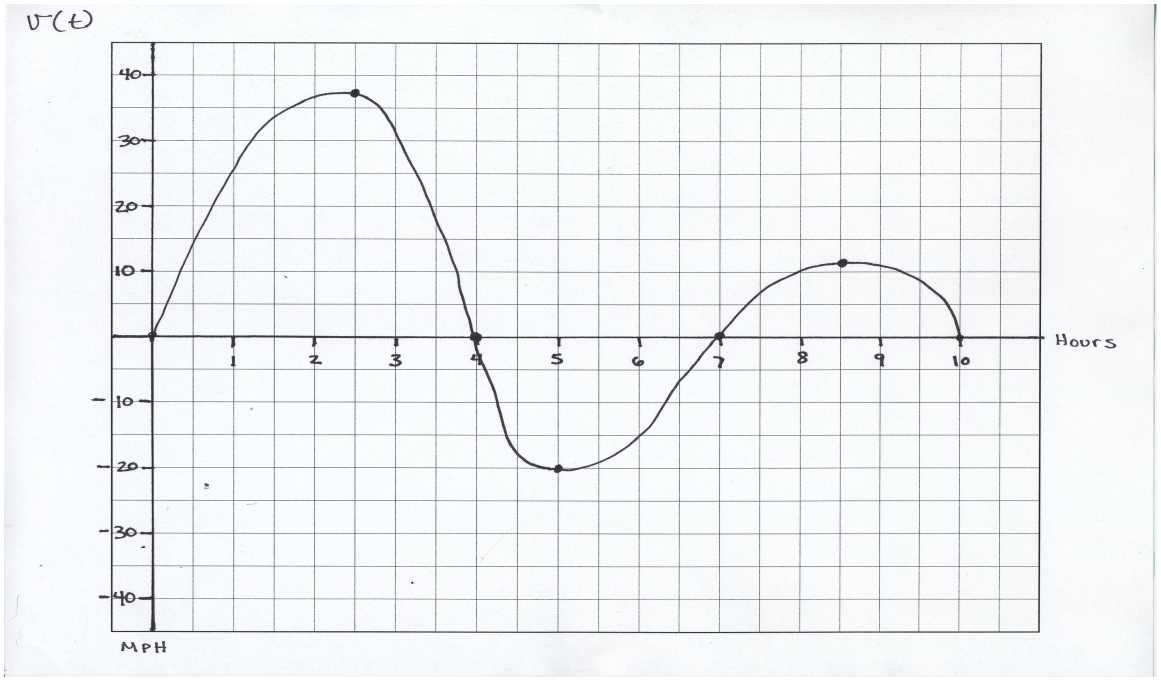
$$a(t) = 3 - 2t$$

If its initial velocity is $v(0) = 4$ and its position at $t = 2$ is $s(2) = 5$

(a.) Find its velocity at time t.

(b.) Find its position when $t = 5$.

(8.)(20 pts.) Suppose that Homer lives on an East-West road. Starting at home, he drives along the road. The velocity $v(t)$ of his car is given in the graph below. Assume that East is the positive direction. Use the graph of $v(t)$ to answer the following questions:



(a.) What is his approximate positions at time $t = 4$ and at time $t = 5$?

(b.) What is the approximate total distance that he has traveled by $t = 7$?

(c.) When is he farthest East from home?