Math 201 21 October 2008 Second Midterm

NAME (Print!): \_\_\_\_\_

Check one: (1pm): \_\_\_\_\_ (2pm): \_\_\_\_\_

Problem	Points	Score
1	20	
2	20	
3	10	
4	30	
5	20	
Total	100	

- **Problem 1 (20 points):** The heat capacity C(T) of a substance is the amount of energy (in joules) required to raise the temperature of 1 gram by 1 degree Celsius above temperature T.
  - (a) Explain why the energy required to raise the temperature from  $T_1$  to  $T_2$  is the area under the graph of C(T) over  $[T_1, T_2]$ .
  - (b) How much energy is required to raise the temperature from 50 to 100 degrees Celsius if  $C(T) = 6 + 0.2\sqrt{T}$ .

**Problem 2 (20 points):** Prove that  $0.277 \le \int_{\pi/8}^{\pi/4} \cos x \, dx \le 0.363$ .

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NAME (Print!):

Check one:	(1pm):
	(2pm):



**Problem 4 (30 points):** Compute the following: (a)  $\frac{d}{dx} \int_x^0 \sin^2 t \ dt$ 

(b)  $\int_0^{\pi/4} \sec^2 \theta \ d\theta$ 

(c)  $\int \frac{dx}{x\sqrt{\ln x}}$ 

- **Problem 5 (20 points):** Let  $f(x) = x^2 5x 6$  and  $F(x) = \int_0^x f(t) dt$ . (a) Find the critical points of F(x) and determine whether they are local minima or maxima.
  - (b) Find the points of inflection of F(x) and determine whether the concavity changes from up to down or vice versa.

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