

Name: \_\_\_\_\_

No books, notes, or calculators are allowed.

**Show your work** and give reasons for your conclusions.

Use the back of the sheet if you need more space.

#	possible	score
1	20	
2	10	
3	30	
4	40	
	100	

1. Compute the following limits. If you use the sandwich theorem or L'Hôpital's rule, then say so.

(a)  $\lim_{x \rightarrow \infty} \frac{e^{2x}}{x^2} =$

(b)  $\lim_{x \rightarrow 0^+} x \ln(x) =$

2. Find the function  $f$  that has  $f'(x) = x^2$  and  $f(2) = 5$ .

3. (a) Based on the definition of the definite integral, use  $n = 4$  rectangles to approximate

$$\int_2^3 \sin(\sqrt{x+2}) dx.$$

- (b) If  $f(0) = 0$  and  $3 \leq f'(x) \leq 5$ , what is the smallest that  $\int_0^4 f(x) dx$  can be?  
What is the largest it can be?

- (c) Compute the area of the region enclosed by the curves  $y = x^2$  and  $y = 2 - x$ .

4. Compute:

$$(a) \frac{d}{dx} \int_2^x \ln(t+5) dt$$

$$(b) \frac{d}{dx} \int_2^5 \sin((t^3+7)^2) dt$$

$$(c) \int_2^2 \sin((t^3+7)^2) dt$$

$$(d) \int (3^x + x^{-3}) dx$$

$$(e) \int (x^{1/3} + 3x^{-1}) dx$$

$$(f) \int_2^4 5\sqrt{x} dx$$

$$(g) \int_3^7 5 \sin(x) dx$$

$$(h) \int \frac{x^2-1}{x} dx$$