Name:_____

Student ID:_____

Section:(See Bubble Sheet)_____

Instructor:_____

Math 112 (Calculus I)
Final Exam Form A

Dec 11, 2012, 7:00-10:00 a.m.

Instructions:

- Work on scratch paper will not be graded.
- For questions 21 to 28, show all your work in the space provided. Full credit will be given only if the necessary work is shown justifying your answer. Please write neatly.
- Should you have need for more space than is allotted to answer a question, use the back of the page the problem is on and indicate this fact.
- Simplify your answers. Expressions such as $\ln(1)$, e^0, $\sin(\pi/2)$, etc. must be simplified for full credit.
- Calculators are not allowed.

For Instructor use only.

#	Possible	Earned
MC	40	
21	8	
22	6	
23	8	
24	12	
Sub	74	

#	Possible	Earned
25	5	
26	6	
27	8	
28	7	
Sub	26	
Total	100	

Free response: Write your answer in the space provided. Answers not placed in this space will be ignored.

21. (8 points) Compute the integrals.

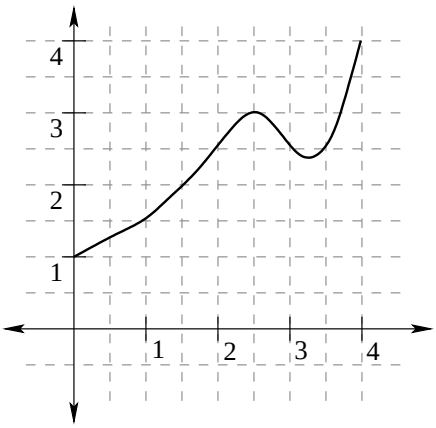
(a) $\displaystyle\int_0^1 \frac{e^{2t}+1}{e^{2t}+2t}\,dt$

(b) $\displaystyle\int_1^2 \frac{x^3+6x^6}{x^5}\,dx$

22. (6 points) The graph of the function f is shown below. Estimate $\displaystyle\int_1^3 f(x)\,dx$ in two ways:

(a) Using four sub-intervals and right endpoints.

(b) Using four sub-intervals and left endpoints.



23. (8 points) A printed poster is to have area 200 square inches with 2 inch margins on the top and bottom, and 1 inch margins on the sides. What dimensions for the poster will ensure that the printed area is as large as possible?

24. (12 points) Compute the following limits. If the limit is infinite, explain whether the limit is ∞ or $-\infty$ or neither.

(a) $\lim_{x \to 0} \dfrac{x + 1 - e^x}{5x^2}$

(b) $\lim_{x \to 3} \dfrac{4x}{(x-3)^2}$

(c) $\lim_{x \to 0} 3x^2 \sin\left(\dfrac{1}{x^2}\right)$

25. (5 points) Use implicit differentiation along with the definition of the function $y = \ln(x)$ as the inverse of the exponential function to prove that

$$\frac{d}{dx}\left(\ln(x)\right) = \frac{1}{x}.$$

No credit will be given if a method other than implicit differentiation is used.

26. (6 points) Prove that the function $f(x) = -x - 3^x$ has at least one root in the interval $(-1, 1)$.

27. (8 points) Gravel is being poured onto the top of a pile that forms a right circular cone in such a way that the radius of the cone is always three times its height. If the gravel is being poured at a rate of 18 m^3/min, at what rate is the height of the cone changing when the height is 2 m? ($V = \frac{1}{3}\pi r^2 h$.)

28. (7 points) Determine where the following function is concave up and concave down on the interval $(0, 2\pi)$.

$$f(x) = e^x \sin(x)$$

END OF EXAM