

- (12) 1. Suppose  $\mathcal{R}$  is the region bounded by  $y = e^x$ ,  $x = 0$ ,  $x = 2$ , and  $y = 0$ .  
 a) Find the volume of the solid that results from rotating  $\mathcal{R}$  around the  $x$ -axis.  
 b) Find the volume of the solid that results from rotating  $\mathcal{R}$  around the  $y$ -axis.

**Note**  $\pi$  and  $e$  should appear in both answers.

- (12) 2. Compute  $\int_1^\infty \frac{\ln x}{x^3} dx$ .

**Note** The answer is a rational number (a quotient of integers). In the computation you will need to apply L'Hopital's rule. Please be sure to indicate where you are doing this and why L'Hopital's rule applies.

- (12) 3. Verify that  $\int_1^2 \frac{5x^2 + 11x + 4}{x(x+1)(x+2)} dx = \ln(12)$ .

- (12) 4. Verify that  $\int_0^1 x \arctan(x) dx = \frac{1}{4}\pi - \frac{1}{2}$ .

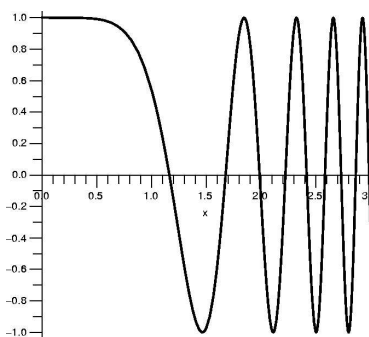
- (12) 5. Compute  $\int_0^1 (\sqrt{x} - 1)^6 dx$ .

**Note** The answer is a rational number (a quotient of integers).

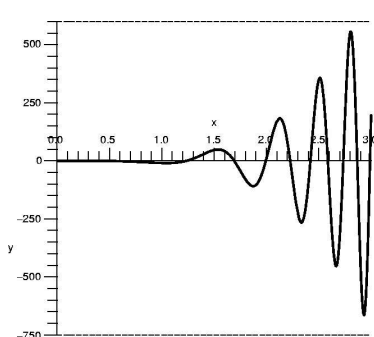
- (14) 6. a) Write the Simpson's Rule estimate for  $\int_0^3 \cos(x^3) dx$  with  $n = 6$  subintervals.

**Note** You are *not* asked to do any arithmetic but asked only to write the sum!

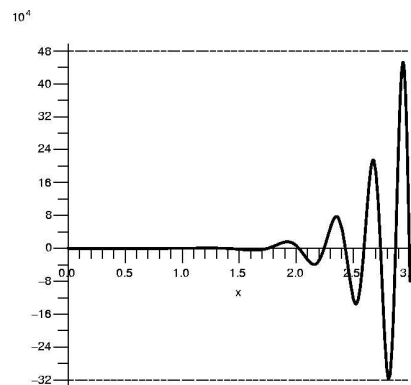
b) Below are graphs of  $y = \cos(x^3)$  and of the second and fourth derivatives of this function on the interval  $[0, 3]$ . Assume that these graphs are correct. You may use information from these graphs to answer the following question. How many subdivisions are needed to estimate  $\int_0^3 \cos(x^3) dx$  with the Trapezoidal Rule to an accuracy of  $10^{-10}$ ?



Graph of  $y = \cos(x^3)$



Graph of the second derivative of  $\cos(x^3)$



Graph of the fourth derivative of  $\cos(x^3)$

- (12) 7. a) Suppose  $A$  is a positive real number and let  $m_A$  be the average value of  $(\sin(Ax))^3$  on the interval  $[0, 2]$ . Compute  $m_A$ .

**Note** The answer will have several terms and will *not* be simple.

- b) What is  $\lim_{A \rightarrow \infty} m_A$ ?

**Note** This answer *should* be simple. Explain briefly why it is correct.

- (14) 8. Find  $\int \frac{1}{x^2 \sqrt{x^2 - 3}} dx$ .

**A****A****First Exam for Math 152****Sections 5, 6, 7 and 9, 10, 11**

FEBRUARY 21, 2007

NAME \_\_\_\_\_

SECTION \_\_\_\_\_

**Do all problems, in any order.****Show your work. An answer alone may not receive full credit.****No texts, notes, or calculators other than the attached formula sheet may be used on this exam.**

Problem Number	Possible Points	Points Earned:
1	12	
2	12	
3	12	
4	12	
5	12	
6	14	
7	12	
8	14	
Total Points Earned:		

**A****A**