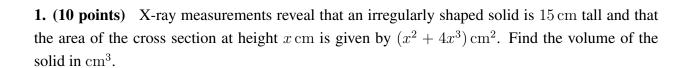
## MATH 2260

## Midterm Exam I September 24, 2005

NAME (please print legibly):
Your University ID Number:
Please complete all questions in the space provided. Draw a box around your final answer. You
may use the backs of the pages for extra space, or ask me for more paper if needed. Work carefully,
and neatly (part of your grade will be based on how well your work is presented).

Try to complete the problems you find easier before going back to the harder ones. Good luck!

QUESTION	VALUE	SCORE
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	2	
10	10	
11	2	
12	10	
TOTAL	104	



**2.** (10 points) Compute the volume of the solid created by revolving the region bounded by the curves  $y = \cos x$ ,  $y = \sin x$ , x = 0 and  $x = \pi/4$  around the x-axis. Use any method that you like.

## **3.** (10 points) Find the length of the portion of the curve

$$x(t) = \ln t - \frac{t^2}{8}, \quad y(t) = t.$$

with t between 1 and 4.

**4.** (10 points) The portion of the curve  $y = \sqrt{4x+4}$  with x between 0 and 1 is rotated around the x axis to generate a surface of revolution. Find the area of this surface.

**5.** (10 points) Assume that the rate of change of atmospheric pressure P(h) with respect to height h is proportional to P(h). (Note: This is true if temperature is constant).

If the pressure at sea level (h=0) is  $101.3\,\mathrm{Kpa}$  and the pressure at  $1000\,\mathrm{m}$  above sea level is  $87.14\,\mathrm{Kpa}$ , what is the pressure at the top of Denali ( $6187\,\mathrm{m}$  above sea level)?

**6.** (10 points) Find the volume of the solid generated by revolving the area bounded by  $y = e^{2x}$ , y = 0, x = 0 and x = 1 around the y-axis.

7. (10 points) State the integration by parts formula and use it to show that

$$\int (\ln x)^n dx = x(\ln x)^n - n \int (\ln x)^{n-1} dx.$$

**8.** (10 points) The force of gravity (in Newtons) on a communications satellite is proportional to the inverse of the square of the distance r (in meters) from the satellite to the center of the earth. If we assume that the radius of the earth is  $6400 \, \mathrm{km}$ , the constant of proportionality K is approximately  $4 \times 10^{17}$ .

Calculate the total work required to lift the satellite to geosynchronous orbit  $(42,000 \,\mathrm{km}$  above *sea level*). Keep in mind that the force required to lift the satellite is **changing** as the distance r increases.

Hint: Be careful of your units.

**9. (2 points)** Bonus: What is the total work required to raise the satellite to an infinite height above the earth?

ANSWER:

<b>11.</b> ( <b>2 points</b> ) Bonus:	· What is the total v	volume of the (i	infinite) portion	n of the solid to	the righ
the line $x = 1$ ?	. What is the total v	orume or the (1	minite) portion	for the solid to	me rigin
21.0					

12. (10 points) Find the area of the surface created by rotating the portion of the curve

$$y = 1 - x^2$$

with x between 0 and 1 around the y-axis.