

Math 125H - Winter 2002
Second Mid-Term Exam
February 26, 2002

Name _____

Section _____

1	10	
2	20	
3	10	
4	20	
5	20	
6	20	
7	20	
8	10	
Total	130	

- Complete all questions.
- You may not use electronic calculation devices during this examination.
- Show all work for full credit.
- You have 80 minutes to complete the exam.

1. Find the area bounded by the curve $y = x^2 - x - 6$ and the x -axis.

2. Consider the region bounded by $y = x^2$, $y = 4 - 3x$ and the x -axis. Express the following volumes in terms of integrals. Feel free to use the "shells" method or the "washer" method as you see fit. **Do not evaluate the integrals.**

(a) The volume of the solid created by revolving the region about the y -axis.

(b) The volume of the solid created by revolving the region about the x -axis.

3. Consider the region in the first quadrant bounded by $y = x^2 - 4$, $y = 5$, $y = 0$ and the y -axis. Suppose a tank has the shape of the solid created by revolving this region about the y -axis. Suppose the tank is filled with water. Write an integral that represents the work done in pumping all the water to the top of the tank, assuming linear units are meters and that water has a density of 1000 kg/m^3 . **Do not evaluate the integral.**

4. Evaluate the following integrals:

(a) $\int e^x \sin 3x \, dx$

(b) $\int \frac{x+1}{x^4-x^3} \, dx$

5. Evaluate the following integrals:

(a)
$$\int \frac{dx}{\sqrt{x^2 - 2x}}$$

(b)
$$\int \sin^5 x \cos^3 x \, dx$$

6. Evaluate the following integrals:

(a)
$$\int \frac{x^3 + x^2 + x + 2}{x^2 + 1} dx$$

(b)
$$\int \frac{x^3}{\sqrt{1 + x^2}} dx$$

7. Evaluate the following integrals:

(a)
$$\int \frac{e^{1/x}}{x^3} dx$$

(b)
$$\int \frac{(\ln x)^5}{x\sqrt{1 + (\ln x)^2}} dx$$

8. Find a value of c so that the average value of the function $f(x) = (x - c)^2$ for x in the interval $[0, c]$ is equal to c .