MATH 152
Exam1
Fall 1997
Version A

Student (Print) _____
Last, First Middle

Student (Sign) _____

Student ID _____

Instructor _____

Section _____

1-10	
11	
12	
13	
14	
15	
TOTAL	

Part I is multiple choice. There is no partial credit. You may not use a calculator.

Part II is work out. Show all your work. Partial credit will be given. You may use your calculator.

Part I: Multiple Choice (5 points each)

There is no partial credit. You may not use a calculator. You have 1 hour.

1. Compute $\int_0^{\pi/4} \tan x \sec^4 x \, dx$

a. $-\frac{\pi}{2}$

b. $\frac{\pi^2}{32} + \frac{\pi^4}{1024}$

c. $\frac{1}{4}$

d. $\frac{3}{4}$

e. $\frac{5}{6}$

2. The integral $\int_0^{\infty} x^2 e^{-x^3} dx$

a. diverges to $-\infty$

b. converges to $-\frac{1}{3}$

c. converges to 0

d. converges to $\frac{1}{3}$

e. diverges to ∞

3. At time t in days, a lump of Thorium contains $M = 200e^{(-t/40)}$ kg of radioactive Thorium-234. In other words, the amount of Thorium-234 drops by a factor of $\frac{1}{e}$ every 40 days. Find the average amount of Thorium-234 present in the first 40 days, i.e. between $t = 0$ and $t = 40$.

a. $8000(e-1)$

b. $200\left(1 - \frac{1}{e}\right)$

c. $200(e-1)$

d. $4000\left(1 + \frac{1}{e}\right)$

e. $100\left(1 + \frac{1}{e}\right)$

4. Find the area between the parabolas $y = 16 - x^2$ and $y = x^2 - 4x$.

a. 38

b. 72

c. 96

d. 102

e. 128

5. Compute $\int_0^{\pi} \sin x\, e^{\cos x}\, dx$

a. $e^{-1} - e$

b. $-e^{-1}$

c. $e^{-1} - 1$

d. $1 - \frac{1}{e}$

e. $e - \frac{1}{e}$

6. The area below the parabola $y = x(4 - x)$ and above the x-axis is rotated about the x-axis. The volume of the solid swept out is given by

a. $\int_0^4 2\pi y\sqrt{4 - y}\, dy$

b. $\int_0^4 2\pi x^2(4 - x)\, dx$

c. $2\int_0^2 2\pi x^2(4 - x)\, dx$

d. $\int_0^4 \pi x^2(4 - x)^2\, dx$

e. $2\int_0^2 2\pi y\sqrt{4 - y}\, dy$

7. The area below the parabola $y = x(4 - x)$ and above the x-axis is rotated about the y-axis. Find the volume of the solid swept out.

a. $\frac{128}{3}\pi$

b. $\frac{64}{3}\pi$

c. $\frac{512}{15}\pi$

d. $\frac{496}{15}\pi$

e. $\frac{108}{5}\pi$

8. Identify which term in the following partial fraction expansion does NOT have the correct form:

$$\frac{2x + 5}{(x - 1)^2(x + 2)(x^2 + 7)} = \frac{A}{x - 1} + \frac{B}{(x - 1)^2} + \frac{C}{x + 2} + \frac{D}{x^2 + 7}$$

where A, B, C and D are constants.

a. $\frac{A}{x - 1}$

b. $\frac{B}{(x - 1)^2}$

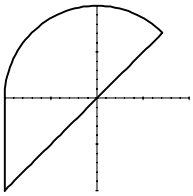
c. $\frac{C}{x + 2}$

d. $\frac{D}{x^2 + 7}$

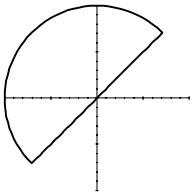
e. None, they all have the correct form.

9. The integral $\int_{-2}^{\sqrt{2}} (\sqrt{4 - x^2} - x)\, dx$ gives the area of which of the following regions?

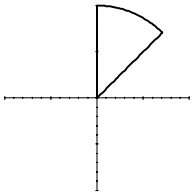
a.



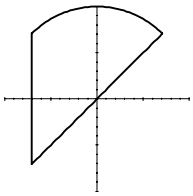
b.



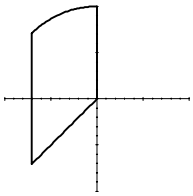
c.



d.



e.



10. Compute $\int_0^1 x^2 e^x\, dx$

a. e
b. $e - 1$
c. $e - 2$
d. $2e - 1$
e. $2e - 2$

Part II: Work Out (10 points each)

Show all your work. Partial credit will be given.
You may use your calculator but only after 1 hour.

11. Compute $\int_{-2}^{2} \sqrt{4 - x^2}\, dx$

12. Compute $\int \frac{4}{(x-1)^2(x+1)}\, dx$

13. Compute $\int x^5 \sin(x^3 - 1)\, dx$

14. It is easy to compute $\int_0^{\pi} \sin x\, dx = 2$ exactly. However, find the approximate value for $\int_0^{\pi} \sin x\, dx$ using the midpoint rule in a Riemann sum with 4 intervals. Use your calculator to give a decimal value.

15. The base of a solid is the triangle with corners $(0,0)$, $(0,1)$ and $(1,0)$. The cross-sections perpendicular to the x-axis are semicircles. Compute the volume of the solid.