Student (Print) _____ Section _____

Last, First Middle

Student (Sign) _____

Student ID _____

Instructor _____

MATH 152
Exam1
Fall 2000
Test Form A

1-10	/50
11	/10
12	/10
13	/10
14	/10
15	/10
TOTAL	

Part I is multiple choice. There is no partial credit.

Part II is work out. Show all your work. Partial credit will be given.

You may not use a calculator.

Formulas:

$$\sin(A+B) = \sin A\cos B + \cos A\sin B$$

$$\cos(A+B) = \cos A\cos B - \sin A\sin B$$

$$\sin^2 A = \frac{1-\cos 2A}{2}$$

$$\cos^2 A = \frac{1+\cos 2A}{2}$$

$$\sin A\sin B = \frac{1}{2}\cos(A-B) - \frac{1}{2}\cos(A+B)$$

$$\sin A\cos B = \frac{1}{2}\sin(A-B) + \frac{1}{2}\sin(A+B)$$

$$\cos A\cos B = \frac{1}{2}\cos(A-B) + \frac{1}{2}\cos(A+B)$$

$$\int \sec\theta\, d\theta = \ln|\sec\theta + \tan\theta| + C$$

$$\int \csc\theta\, d\theta = \ln|\csc\theta - \cot\theta| + C$$

$$\int \ln x\, dx = x\ln x - x + C$$

Part I: Multiple Choice (5 points each)

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

1. What is the average value of the function $f(x) = x^3$ on the interval $[-1, 2]$.

a. $\frac{5}{4}$

b. $\frac{15}{4}$

c. 4

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

e. $\frac{20}{3}$

2. Using a trigonometric substitution, the integral $\int \frac{dx}{\sqrt{9 + x^2}}$ becomes:

a. $\int \sec\theta \, d\theta$

b. $\int \frac{d\theta}{3\sec\theta}$

c. $\int \frac{d\theta}{\sec\theta}$

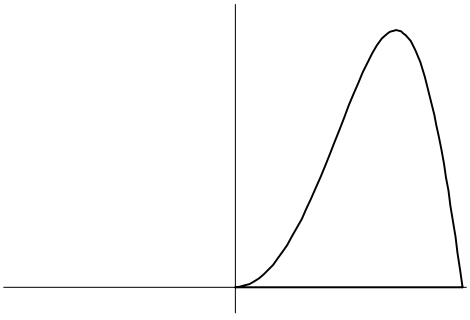
d. $\int 3\tan\theta \, d\theta$

e. $\int \frac{d\theta}{\tan\theta}$

3. The region bounded by the curves

$y = \sin(x^2)$, $y = 0$, $x = 0$ and $x = \sqrt{\pi}$

is rotated about the y-axis. Find the volume.



a. 1

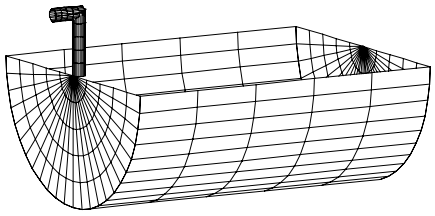
b. 2

c. π

d. 2π

e. 4π

4. A tank has the shape of a half cylinder which is 5 m long and 2 m in radius laying on its side. The tank is full of water. Which integral gives the work done to pump the water out of a spout which is 1 m above the tank.
The density of water is $\rho = 1000$ kg/m^3.
The acceleration of gravity is $g = 9.8$ m/sec^2.
Measure y down from the axis of the cylinder.



a. $9800 \int_{-2}^{2} (y+1)10\sqrt{4-y^2}\, dy$

b. $9800 \int_{-2}^{2} (1-y)5\sqrt{4-y^2}\, dy$

c. $9800 \int_{0}^{2} (1-y)10(2-y)\, dy$

d. $9800 \int_{0}^{2} (y+1)5(2-y)\, dy$

e. $9800 \int_{0}^{2} (y+1)10\sqrt{4-y^2}\, dy$

5. Compute $\int_{0}^{1} (x-2)\, e^x\, dx$.

a. $1 - 2e$

b. 1

c. $3 - 2e$

d. $-2e$

e. 3

6. Evaluate $\int \cos^3 x\,dx$.

a. $\frac{\sin^4 x}{4} + C$

b. $\frac{\sin^2 x}{2} - \frac{\sin^4 x}{4} + C$

c. $\frac{\cos^4 x}{4} + C$

d. $\sin x - \frac{\sin^3 x}{3} + C$

e. $-\frac{\cos^4 x}{4} + C$

7. Which of these integrals represents the area between the curves $y = \sin x$ and $y = \cos x$ from $x = 0$ to $x = \pi$.

a. $\int_0^{\pi/4} (\cos x - \sin x)\,dx + \int_{\pi/4}^{3\pi/4} (\sin x - \cos x)\,dx + \int_{3\pi/4}^{\pi} (\cos x - \sin x)\,dx$

b. $\int_0^{\pi/4} (\cos x - \sin x)\,dx + \int_{\pi/4}^{\pi} (\sin x - \cos x)\,dx$

c. $\int_0^{\pi/4} (\sin x - \cos x)\,dx + \int_{\pi/4}^{\pi} (\cos x - \sin x)\,dx$

d. $\int_0^{\pi} (\cos x - \sin x)\,dx$

e. $\int_0^{\pi} (\sin x - \cos x)\,dx$

8. Evaluate $\int_0^4 x\sqrt{9 + x^2}\,dx$.

a. $\frac{147}{2}$

b. $\frac{98}{3}$

c. 6

d. $\frac{392}{3}$

e. $\frac{8}{3}$

9. The base of a solid is the circle $x^2 + y^2 = 9$. The cross sections perpendicular to the x-axis are squares. Find the volume.

a. 9π

b. 36

c. 72

d. 81π

e. 144

10. What is the form of the partial fraction decomposition of $\frac{x^2+3}{x^3-2x^2+x}$?

a. $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{(x-1)^2}$

b. $\frac{A}{x^3} + \frac{B}{2x^2} + \frac{C}{x}$

c. $\frac{A}{x} + \frac{B}{x-1} + \frac{C}{(x-1)^2}$

d. $\frac{A}{x} + \frac{B}{(x-1)^2}$

e. $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x-1} + \frac{D}{(x-1)^2}$

Part II: Work Out (10 points each)

Show all your work. Partial credit will be given.

You may not use a calculator.

11. Compute $\int x^3 \ln x \, dx$.

12. Find the area between the curves $x = y^2 - 1$ and $y = x - 5$.

a. (4 pts) Graph the curves.

b. (4 pts) Set up the integral(s) for the area.

c. (2 pts) Compute the area.

13. Compute $\int_0^{\pi/3} \tan^3 x \sec x \, dx$.

14. Evaluate $\int_0^{\sqrt{2}/2} \frac{x^2}{\sqrt{1-x^2}} \, dx$.

15. Consider the region in the plane bounded by the curves $\sqrt{x-1}$, $x = 3$, $x = 6$ and $y = 0$.

a. (3 pts) Graph the region.

b. (1 pt) The region is rotated about the x-axis. To find the volume, you will use

an x-integral a y-integral (Circle one.)

with

disks washers cylindrical shells (Circle one.)

c. (4 pts) Set up the integral(s) for the volume.

d. (2 pts) Compute the volume.