Multiple Choice

1.(6 pts.) Evaluate the following integral by making an appropriate substitution

$$\int_0^1 \frac{t+t^2}{\sqrt{3t^2+2t^3+1}}dt = ?$$

(a) $\frac{\sqrt{6}-1}{3}$ (b) $\frac{5}{2}$ (c) $\frac{1}{3}$ (d) $\frac{\sqrt{3}-1}{2}$ (e) $\frac{\sqrt{3}-\sqrt{2}}{3}$

2.(6 pts.) If f(x) is continuous and $\int_0^3 f(x)dx = 12$ find

$$\int_1^2 xf(x^2-1)dx \ .$$

(a) -4 (b) 0 (c) 6 (d) 10 (e) 24

3.(6 pts.) Calculate the definite integral

$$\int_{-\pi}^{\pi} \sin(\sin u)du = ?$$

(a) 2π (b) $\frac{\pi}{2}$ (c) 2 (d) 0 (e) $\frac{3\pi}{2}$

4.(6 pts.) Let $y(x)$ denote the solution of the equation

$$\frac{dy}{dx} = x^2(x-1)$$

such that $y(1) = 2$. Then $y(0) = ?$.

(a) $\frac{1}{4}$ (b) $\frac{20}{3}$ (c) $\frac{16}{15}$ (d) $\frac{25}{12}$ (e) $\frac{21}{15}$

5.(6 pts.) Calculate the following definite integral

$$\int_1^4 \frac{2u-1}{\sqrt{u}} du = ?$$

(a) $\frac{30}{3}$ (b) 3 (c) $\frac{21}{2}$ (d) $\frac{22}{3}$ (e) 0

6.(6 pts.) A rocket is fired vertically into the air. Its velocity at t seconds after lift-off is $v(t) = 8t + 1$ meter per second. Before launch, the top of the rocket is 10 meters above the launch pad. Find the height of the rocket (measured from the top of the rocket to the launch pad) at 3 seconds.

(a) 25 meters (b) 42 meters (c) 39 meters (d) 35 meters (e) 49 meters

7.(6 pts.) Evaluate the following integral

$$\int_0^2 |x^2 - 1| dx = ?$$

(a) 0 (b) 2 (c) $\frac{5}{3}$ (d) $\frac{1}{3}$ (e) $\frac{2}{3}$

8.(6 pts.) Calculate the definite integral

$$\int_0^{\pi} ((\sin\theta)^2 + 1)\cos\theta d\theta = ?$$

(a) $\frac{3\pi}{2}$ (b) π (c) $\frac{\pi}{3}$ (d) 1 (e) 0

9.(6 pts.) Find the definite integral

$$\int_{-\pi}^{\pi} \big(\cos(x+\pi) - \sin(x-\pi)\big) dx.$$

(a) 2π (b) 0 (c) π (d) 2 (e) 1

10.(6 pts.) Find the area of the domain bounded by the graph of $y = x^3 - 1$, the x-axis and the two vertical lines $x = 1$ and $x = 4$.

(a) $-(5\ \frac{1}{4})$ (b) $60\ \frac{3}{4}$ (c) $11\ \frac{1}{2}$ (d) $4\ \frac{1}{3}$ (e) $-(23\ \frac{1}{4})$

Partial Credit

You must show your work on the partial credit problems to receive credit!

11.(10 pts.) Write down the formula given by Newton method for solving the equation

$$x^3 + x^2 + 1 = 0 \ .$$

Tell why there is a solution to this equation in the interval $[-2, -1]$.

12.(10 pts.) A rectangular garden of area 80 square feet is to be surrounded on three sides by a brick wall costing \$20 per foot and on one side by a fence costing \$10 per foot. Find the dimensions of the garden such that the cost of materials is minimized. Describe your solution in detail.

13.(10 pts.) Find all points on the parabola $y = x^2$ that are closest to the point (0,1). Justify your answer in detail.

14.(10 pts.)

Use Riemann sums to calculate the following integral:

$$\int_0^1 (3x^2 + 2)dx \ .$$

Pick x_i^* to be the right-hand endpoint of each subinterval. Justify your solution in detail.

Hint: You can use the following formulae:

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2} \ , \qquad \sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} \ , \qquad \sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4} \ .$$

Name: ANSWERS

Instructor: ANSWERS

Exam III
December 4, 2001

- The Honor Code is in effect for this examination. All work is to be your own.
- No calculators.
- The exam lasts for one hour.
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 10 pages of the test.

Good Luck!

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!

1.	(•)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(•)	(d)	(e)
3.	(a)	(b)	(c)	(•)	(e)
4.	(a)	(b)	(c)	(•)	(e)
5.	(a)	(b)	(c)	(•)	(e)
6.	(a)	(b)	(c)	(d)	(•)
7.	(a)	(•)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(•)
9.	(a)	(•)	(c)	(d)	(e)
10.	(a)	(•)	(c)	(d)	(e)

DO NOT WRITE IN THIS BOX!

Total multiple choice: _____

11. _____

12. _____

13. _____

14. _____

Total: _____