

# MA2160      Final Exam, Part I

May 7, 2003

Do all problems

Show all work

Calculators are **not** allowed on Part I

Your Name: \_\_\_\_\_ ID: \_\_\_\_\_

Please circle your section number.

Section	Instructor	Days & Times	Score (Part I)
R01	D. Pray	MWF 8 a.m.	pg 1 = _____ / 12
R03	I. Kliakhandler	MWF 9 a.m.	pg 2 = _____ / 12
R04	L. Young	MWF 9 a.m.	pg 3 = _____ / 10
R05	B. Baartmans	MWF 10 a.m.	pg 4 = _____ / 10
R06	C. Sarami	MWF 11 a.m.	pg 5 = _____ / 9
R07	O. Paez Osuna	MWF 11 a.m.	pg 6 = _____ / 8
R08	B. Bertram	MWF 12 p.m.	total = _____ / 61
R09	G. Lewis	MWF 2 p.m.	<u>TOTAL SCORE</u>
R10	C. Gay	MWF 8 a.m.	Part 1 = _____ / 61
R11	G. Lewis	MWF 3 p.m.	Part 2 = _____ / 39
R12	D. Olson	MWF 4 p.m.	TOTAL = _____ / 100

Work on Part I first. It will be collected sometime during the middle of the exam period.

You may work on Part I of this exam at any time, but you must have handed in Part I before you may use your calculator on Part II.

1. Consider the vectors  $\vec{u} = 3\vec{i} + 2\vec{j} - \vec{k}$ ,  $\vec{v} = 4\vec{i} - \vec{j} - 8\vec{k}$ , and  $\vec{w} = 2\vec{i} - 2\vec{k}$ . Find

(a)  $\vec{u} \cdot \vec{v}$

$$\vec{u} \cdot \vec{v} = \underline{\hspace{2cm}} \quad (2 \text{ points})$$

(b)  $\vec{v} \times \vec{w}$

$$\vec{v} \times \vec{w} = \underline{\hspace{2cm}} \quad (3 \text{ points})$$

(c) A unit vector in the direction of  $\vec{u}$

$$\text{unit vector} = \underline{\hspace{2cm}} \quad (3 \text{ points})$$

(d) The component of  $\vec{v}$  in the direction of  $\vec{u}$

$$\text{component of } \vec{v} \text{ in the direction of } \vec{u} \underline{\hspace{2cm}} \quad (4 \text{ points})$$

2. Find an equation of the plane which is perpendicular to  $3\vec{i} + 2\vec{j} - \vec{k}$  and contains the point  $(4, -6, 3)$ .

equation of plane: \_\_\_\_\_ (4 points)

3. Evaluate the following integrals.

(a)  $\int x\sqrt{x^2 + 4} dx$

$\int x\sqrt{x^2 + 4} dx =$  \_\_\_\_\_ (4 points)

(b)  $\int x \sin x dx$

$\int x \sin x dx =$  \_\_\_\_\_ (4 points)

4. Find the partial fractions decomposition of the function  $f(x) = \frac{x + 4}{x^3 - 3x^2 + 2x}$ .  
Do not integrate.

$$\frac{x + 4}{x^3 - 3x^2 + 2x} = \text{_____} \quad (4 \text{ points})$$

5. Evaluate  $\int_0^1 x^2 e^{(x^3+1)} dx$  exactly.

$$\int_0^1 x^2 e^{(x^3+1)} dx = \text{_____} \quad (6 \text{ points})$$

6. Evaluate the improper integral  $\int_2^{\infty} \frac{1}{x^{3/2}} dx$  or show that it diverges.

answer:\_\_\_\_\_ (5 points)

7. Find the mass of a rod of length 20cm with mass density  $\delta(x) = e^{-x/10}$  gm/cm at a distance of  $x$  cm from the left end. Include units.

mass=\_\_\_\_\_ (5 points)

8. Find the sum of the geometric series  $12 - 6 + 3 - 3/2 + 3/4 - \dots$

sum=\_\_\_\_\_ (4 points)

9. Find the quadratic approximation (that is, the polynomial,  $P_2(x)$ ) to  $f(x) = 2^x$  about  $x = 0$ . Hint:  $f'(x) = 2^x \ln 2$ .

$P_2(x) =$ \_\_\_\_\_ (5 points)

10. Write the first four nonzero terms of the Taylor Series expansion of  $\frac{1}{1-2x}$  about  $x = 0$ .

first four terms=\_\_\_\_\_ (4 points)

11. Check by substitution that  $y(t) = 5\sin(2t) + 12\cos(2t)$  is a solution of the differential equation  $y'' + 4y = 0$ .

(4 points)