

**Math 241 Exam 2 Summer 2002**

PRINT Your Name: \_\_\_\_\_

There are 10 problems on 5 pages. Each problem is worth 5 points. SHOW your work. CIRCLE your answer. **NO CALCULATORS!**

I will put your exam outside my office door by noon on Friday. You may pick it up any time before class on Monday. If I know your e-mail address, I will e-mail your score on Exam 2 to you.

- Graph and describe the graph of  $xy = 0$  in 3-space.
- Graph and describe the graph of the curve whose position vector is

$$\vec{r}(t) = \cos t \vec{i} + t \vec{j} + \sin t \vec{k}$$

in 3-space.

- Find the equations of the line through the points  $P = (2, -3, 4)$  and  $Q = (3, 4, 6)$ . **Check your answer.**
- Find the equation of the plane through the points  $P = (1, 1, 2)$ ,  $Q = (2, 3, 6)$ , and  $R = (-1, -1, 0)$ . **Check your answer.**
- Find the area of the triangle with vertices  $P = (1, 2, 4)$ ,  $Q = (2, 1, 2)$ , and  $R = (2, 4, 6)$ .
- Find the intersection of the two lines:

$$\frac{x-8}{3} = \frac{y-7}{4} = \frac{z-6}{1} \quad \text{and} \quad \frac{x-5}{1} = \frac{y-5}{2} = \frac{z-13}{3}.$$

**Check your answer.**

- Consider the curve whose position vector is

$$\vec{r}(t) = 2t^2 \vec{i} - t^3 \vec{j} + \frac{4}{t} \vec{k}.$$

Find the equation of the line tangent to this curve at  $t = 1$ .

- (There is no partial credit for this problem. Make sure your answer is correct.)** Let  $\vec{a} = 1\vec{i} - 2\vec{j} + 2\vec{k}$  and  $\vec{b} = 6\vec{i} - 7\vec{j} + 8\vec{k}$ . Find vectors  $\vec{u}$  and  $\vec{v}$  with  $\vec{b} = \vec{u} + \vec{v}$ ,  $\vec{u}$  parallel to  $\vec{a}$ , and  $\vec{v}$  perpendicular to  $\vec{a}$ . (Every number in the answer is an integer. If you have fractions, either you can rid of them or you have made a mistake.)
- Find the point on  $x + 2y + 3z = 10$  which is closest to  $(1, 5, 9)$ .
- Find the length of the curve whose position vector is

$$\vec{r}(t) = t^2 \vec{i} - 2t^3 \vec{j} + 6t^3 \vec{k},$$

for  $0 \leq t \leq 1$ .