Mathematics 102
FINAL
August 14, 2003, 8:00-9:30

Name:_____

ID:_____

Important Instructions:

1. The entire solution of each problem must be written in the space beneath the problem.
2. You may lose up to 90% of the available credit for not providing essential explanations.
3. Do not separate these pages.
4. The pink booklets are merely a source of scrap paper.
   I will not read what is in them.
   You may take your pink booklet after the test.

If you have any comments write them here:

Good Luck!

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	**Total**

Some trigonometric formulas

$$\cos^2 x = 1 - \sin^2 x, \quad \sec^2 x = 1 + \tan^2 x$$

$$\cos^2 x = \frac{1}{2}(1 + \cos 2x), \quad \sin^2 x = \frac{1}{2}(1 - \cos 2x)$$

Problem 1. 5 pts

Find the point in which the line $x = 1 + 2t,\ y = 1 + 5t,\ z = 3t$ meets the plane $x + y + z = 2$.

Problem 2. 5 pts

Is the line $x = 1 - 2t,\ y = 2 + 5t,\ z = -3t$ parallel to the plane $2x + y - z = 8$? Give reasons for your answer.

Problem 3. 5 pts

Find parametrization for the line in which the planes $x - 2y + 4z = 2$ and $x + y - 2z = 5$ intersect.

Problem 4. 5 pts

Find the plane determined by the intersecting lines

$L_1: \ x = t, \ y = 3 - 3t, \ z = -2 - t$

$L_2: x = 1 + s, \ y = 4 + s, \ z = -1 + s.$

Problem 5. 5 pts

Let $\vec{v} = 5\vec{j} - 3\vec{k}$ and $\vec{u} = \vec{i} + \vec{j} + \vec{k}$,

Find

a) the cosine of the angle between $\vec{v}$ and $\vec{u}$

b) the scalar component of $\vec{v}$ in the direction of $\vec{u}$

c) the vector $proj_{\vec{v}}\ \vec{u}$

d) $\left|\vec{u} \times \vec{v}\right|$

Problem 6. 5 pts

Find the center and radius of the sphere $2x^2 + 2y^2 + 2z^2 + 4y - 4z = 9$.

Problem 7. 5 pts

Find a vector of magnitude 3 in the direction opposite to the direction of $\vec{u} = \frac{1}{2}\vec{i} - \frac{1}{2}\vec{j} - \frac{1}{2}\vec{k}$.

Problem 8. 5 pts

Find an equation for the line through P(1,2) parallel to $\vec{u} = -\vec{i} - 2\vec{j}$.

Problem 9. 5 pts

Evaluate $\int e^{\sin x} \cos x \, dx$.

Problem 10. 5 pts

Evaluate $\int x^2 \cos x \, dx$.

Problem 11. 5 pts

Evaluate $\int \frac{3x^2+12x+11}{(x+1)(x+2)(x+3)}dx.$

Problem 12. 5 pts

Evaluate $\int x^p \ln x \, dx$.

Problem 13. 5 pts

Evaluate $\int e^t \cos(3e^t - 2) \, dt$.

Problem 14. 5 pts

Evaluate $\int \frac{dx}{\sqrt{x^2-4}}$.

Problem 15. 5 pts

Evaluate $\int \sin^3 x\, dx$.

Problem 16. 5 pts

Find the length of the curve $y = \frac{x^2}{8} - \ln x, \quad 4 \le x \le 8.$