Math 241, Fall 2000, Exam 2

PRINT Your Name:_________________________________

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

1. **(There is no partial credit for this problem. Make sure your answer is correct.)** Find the equation of the plane through $(1,-3,2)$, $(4,5,1)$, and $(-1,2,-3)$.

2. **(There is no partial credit for this problem. Make sure your answer is correct.)** Find the equations of the line through $(4,7,9)$ and $(1,-2,6)$.

3. Find the equations of the line which contains $(1,3,4)$ and is perpendicular to $2x-9y+4z=8$.

4. Find the equation of the plane which contains $(5,8,9)$ and is perpendicular to $\frac{x-3}{7}=\frac{y-2}{9}=\frac{z-6}{8}$.

5. Find the point of intersection of the following lines. **CHECK YOUR ANSWER!**
$$\frac{x+5}{-1}=\frac{y-10}{4}=\frac{z+3}{-1} \quad \text{and} \quad \frac{x}{1}=\frac{y-8}{2}=\frac{z-8}{3}$$

6. Find the length of the curve parameterized by $\overrightarrow{\boldsymbol{r}}(t)=\sqrt{6}t^2\,\overrightarrow{\boldsymbol{i}}+\frac{2}{3}t^3\,\overrightarrow{\boldsymbol{j}}+6t\,\overrightarrow{\boldsymbol{k}}$ for $3\le t\le 6$.

7. What are the equations of the line tangent to the curve parameterized by $\overrightarrow{\boldsymbol{r}}(t)=3t\,\overrightarrow{\boldsymbol{i}}+2t^2\,\overrightarrow{\boldsymbol{j}}+t^5\,\overrightarrow{\boldsymbol{k}}$ at $t=-1$?

8. Find the equations of **any** line which is contained on the plane $x+3y+3z=6$.

9. **(There is no partial credit for this problem. Make sure your answer is correct.)** Let $\overrightarrow{\boldsymbol{a}}=\overrightarrow{\boldsymbol{i}}+2\,\overrightarrow{\boldsymbol{j}}+3\,\overrightarrow{\boldsymbol{k}}$ and $\overrightarrow{\boldsymbol{b}}=1\,\overrightarrow{\boldsymbol{i}}+3\,\overrightarrow{\boldsymbol{j}}+7\,\overrightarrow{\boldsymbol{k}}$. Find vectors $\overrightarrow{\boldsymbol{u}}$ and $\overrightarrow{\boldsymbol{v}}$ with $\overrightarrow{\boldsymbol{b}}=\overrightarrow{\boldsymbol{u}}+\overrightarrow{\boldsymbol{v}}$, $\overrightarrow{\boldsymbol{u}}$ parallel to $\overrightarrow{\boldsymbol{a}}$, and $\overrightarrow{\boldsymbol{v}}$ perpendicular to $\overrightarrow{\boldsymbol{a}}$.

10. Find the point on $3x+5y+2z=57$ which is closest to $(1,2,3)$.