Calculus II, Exam I, Spring 2013

Name:_____

Student signature:_____

Show all your work and give reasons for your answers.
Good luck!

Part I

Each problem in part I is worth 6 points; Show your work!!

(1) Find the angle between the vectors $\vec{a} = < -1, 1, -12 >$ and $\vec{b} = < 1, 3, 2 >$. (You may express your answer in terms of $\cos^{-1} = \arccos$.)

(2) Find the equation of the line perpendicular to the plane $2x - y + 3z = 4$ which passes through the point $(11, -1, 2)$.

(3) Find the area of the parallelogram spanned by the vectors $< -1, 0, 1 >$ and $< 1, -2, 1 >$.

(4) If $\vec{a} = < 2, -1, -3 >$ and $\vec{b} = < 1, 1, 2 >$ find the component $\text{com}_{\vec{b}}(\vec{a})$.

(5) if $\vec{u} = < 1, 0, 1 >$ and $\vec{v} = < -1, 2, 1 >$ is $\vec{u}$ perpendicular to $\vec{v}$? (You **must** justify your answer.)

(6) If $\vec{r}(t) = < \cos(t),\ t^2,\ t >$, find $\lim_{t \to \pi} \vec{r}(t)$.

(7) If $\vec{r}(t) = < \ln(t),\ \sin(t),\ t^2 >$ find the derivative $\vec{r}\,'(t)$.

(8) If $\vec{r}(t) = < \ln(t),\ \sin(t),\ t^2 >$, find the unit tangent vector $T(t)$ (Do not simplify).

(9) Find the angle between the planes $2x - y + z = 2$ and $x + 2y - 2z = 10$.

(10) Are the vectors $\vec{a} =< 1, -3, 4 >$ and $\vec{b} =< -2, 5, -8 >$ parallel? (You **must** justify your answer.)

(11) Are the vectors $< 1, 0, 2 >$, $< 2, 3, 1 >$ and $< 0, 1, -1 >$ coplanar (You **must** justify your answer!)

Part II

(1) (a) **5 points** Find the distance from the plane $2x + y - z = 3$ to the line

$$\ell = \begin{cases} x = 1 + 2t, \\ y = 1 - t, \\ z = 2 + 2t. \end{cases}$$

(b) **10 points** Find the distance from the point $(-1, 2, 1)$ to the plane $2x + y - z = 3$.

(2) [**19 points**] Given the lines:

$$\ell_1 = \begin{cases} x = 1 + t \\ y = 2 - t \\ z = 5 + t \end{cases} \quad \text{and} \quad \ell_2 = \begin{cases} x = -1 + s \\ y = 2 + s \\ z = 3 + s \end{cases}$$

determine if they are skew or not. If they are skew, find their distance. If not, find the point of intersection.