Assignment 7 Part II

1. Find the curvature of the curve $\vec{r}(t) = < 2t, 5\cos t, 5\sin t >$

2. Evaluate (if possible) $Lim_{(x,y)\to(0,0)} \dfrac{1-\cos\left(x^2+y^2\right)}{x^2+y^2}$

3. For $f(x,y)=\begin{cases}\dfrac{5x^2y}{x^3+y^3} & if \quad (x,y)\neq(0,0)\\ 0 & if \quad (x,y)=(0,0)\end{cases}$

a) Find $f_x(0,0)$ and $f_y(0,0)$

b) Is the function differentiable at (0,0) ? Explain your answer.

4. Find the directional derivative of the function $f(x,y,z)=xye^z$ in the direction from (2,4,0) to Q(0,0,0)

5. Find an equation of the tangent plane to the surface $x = y(2z - 3)$ at (4,4,2.)

6. Examine the function $f(x,y)=2x^2+6xy+9y^2+8x+14$ for relative extrema.

7. Find $k$ such that $f(x,y)=\begin{cases} kxy & if \quad 0\le x\le 1, 0\le y\le x \\ 0 & \text{otherwise} \end{cases}$ is a probability density function.

8. Evaluate $\int_0^5 \int_0^{\sqrt{25-x^2}} \int_0^{\sqrt{25-x^2-y^2}} \frac{1}{1+x^2+y^2+z^2} dzdydx$

9. Determine if the vector field $\vec{F}(x,y,z)=\left(4xy+z^2\right)i+\left(2x^2+6yz\right)j+2xzk$ is conservative. If it is, find a potential function for this vector field.

10. Evaluate $\iint_S \vec{F} \bullet NdS$ where $\vec{F}(x,y,z) = < x,y,z >$ and $S$ is the surface of the region Q bounded by the coordinate planes and the plane $2x+3y+4z=12$