HOMEWORK #3 (9.6 ~9.8)

Due on March 15

1) Find an equation of the tangent plane to the graph of the given equation at the indicated point $x^2 + y^2 + z^2 = 9;\ (-2,2,1)$ (Problem 15, page 480).

2) Graph some representative vectors in the given vector field, and find the curl and the divergence of the given vector field. Also, what can you say about a source or sink based on the divergent result ? $\vec{F}(x, y) = x\vec{i} + y\vec{j}$ (Problem 1, page 484).

3) Find the curl and the divergence of the given vector field $\vec{F}(x, y, z) = (x - y)^3\vec{i} + e^{-yz}\vec{j} + xye^{2y}\vec{k}$ (Problem 10, page 484).

4) For a differentiable function $f(x, y, z)$

(1) compute $\nabla f(x, y, z)$

(2) is $\nabla f(x, y, z)$ a scalar or vector ?

(3) Show that $\nabla \cdot \nabla f = \dfrac{\partial^2 f}{\partial x^2} + \dfrac{\partial^2 f}{\partial y^2} + \dfrac{\partial^2 f}{\partial z^2}$

This is known as the Laplacian and is also written $\nabla^2 f$ (Problem 33, page 485).

5) Evaluate $\int_C G(x, y)dx$, $\int_C G(x, y)dy$ and $\int_C G(x, y)ds$ on the indicated curve C

$G(x, y) = 2xy;\ \ x = 5\cos(t),\ \ y = 5\sin(t),\ 0 \le t \le \pi/4$ (Problem 1, page 493).