Math 210 – Fall 2010 Name: _____

First Hour Exam

(20 pts) **1.** Do the following computations.

(a) Compute $\langle 1, 2, 3\rangle \cdot \langle -2, 0, 1\rangle$.

(b) Compute $\langle 1, -1, 3\rangle \times \langle -2, -3, 1\rangle$.

(c) Find a normal vector to the plane described by $7x + 2y - 3z$.

(d) Determine if the equations $x - y + 2z = 1$ and $-x + y - 2z = 3$ describe parallel planes, and give a reason.

(e) If $P = (4, 2, -3)$ and $Q = (2, 1, 5)$, express the vector $\overrightarrow{PQ}$ in terms of the standard unit vectors **i**, **j** and **k**.

(20 pts) **2.** Consider the three points $P = (2, -1, 3)$, $Q = (2, 1, -2)$, and $R = (1, 1, 0)$ in $\mathbb{R}^3$.

(a) Find an equation for the plane which contains P, Q and R.

(b) Find the area of the triangle with vertices at P, Q and R.

(15 pts) **3.** Let c be the curve given by $c(t) = \langle \cos 2t, 3t - 1, \sin 2t\rangle$.

(a) Find parametric equations for the tangent line to c at $t = \frac{\pi}{4}$.

(b) Find the length of the curve c between $t = -\pi$ and $t = \pi$.

(c) Find the curvature of c at $t = 0$.

(15 pts) **4.** Find an equation for the tangent plane to the surface $x^2 + 2y^2 - z^2 = 12$ at the point $(2, 2, 2)$.

(15 pts) **5.** Find the linear function $L(x, y)$ which gives the best linear approximation to the function $f(x, y) = x\cos(\pi y) + ye^x$ at the point $(1, 1)$.

(15 pts) **6.** Let $f(x, y) = \dfrac{x^2}{x^2 + y^2}$. Show that $\lim\limits_{(x,y)\to(0,0)} f(x, y)$ does not exist.

Hand in this sheet along with your exam booklet!