**Term Test 1**



DATE: February 10, 2011 TIME: 70 minutes
COURSE: MATH 2130 EXAMINER: G.I. Moghaddam

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[7] 1. Find standard equation of the plane containing the two points $P(2,3,2)$ and $Q(-1,4,1)$ which is perpendicular to the plane $2x+y+2z=6$.

[7] 2. Identify and sketch the surface with the equation

$$x^2 - y^2 + z^2 - 4x - 8z + 20 = 0.$$

Mark the important points.

[10] 3. Consider the point $P(3,3,1)$, the plane $\Pi: \quad 2x-y+2z-11=0$, and the line

$$\ell: \quad x = 1+t \quad , \quad y = 4-2t \quad , \quad z = 2-2t\,.$$

If $d_1$ is the distance from the point P to the plane $\Pi$, and $d_2$ is the distance from the point P to the line $\ell$, show that $d_1 = d_2^2$.

[7] 4. Find a parametric representation for the curve

$$x - y = 4z\,, \qquad xy + 4z^2 = 0$$

directed so that $z$ decreases along the curve.

[7] 5. Find a tangent vector of length $5\sqrt{3}$ to the curve $C$ with the vector representation

$$\mathbf{r}(t) = [\,e^{\pi-t}\ln(t-\pi+1)\,]\,\hat{\mathbf{i}} + [\,e^{\pi-t}\cos t\,]\,\hat{\mathbf{j}} + [\,e^{\pi-t}\sin t\,]\,\hat{\mathbf{k}}$$

at the point $(0,-1,0)$.

[12] 6. Given the curve $C$ with vector representation

$$C: \quad \mathbf{r}(t) = 2t\,\hat{\mathbf{i}} + t^2\,\hat{\mathbf{j}} + (\frac{1}{3}t^3)\,\hat{\mathbf{k}}$$

[6] (a) Find the arc length of the curve $C$ from the point $(2,1,\frac{1}{3})$ to the point $(6,9,9)$.

[6] (b) First form $(3\,\mathbf{r}(\mathbf{t}) + \mathbf{r}''(\mathbf{t})) \times \mathbf{r}''(\mathbf{t})$ and then show that it is perpendicular to $\mathbf{r}(\mathbf{t})$ for all values of $t$.