CALCULUS III ASSIGNMENT 4 Due on Friday Oct. 12

- 1. (a) Find the vector normal to the plane through the points P(1, -1, 0), Q(2, 1, -1) and R(-1, 1, 2).
 - (b) Find the area of the triangle formed by the above three points.
- 2. Find the equation of the plane passing through the line of intersection of the two planes x + y = 2, y z = 3 and which is perpendicular to the plane 2x + 3y + 4z = 5.
- 3. Find the unit tangent vector, the principal normal, the curvature and the arc length of the curve over the interval $1 \le t \le 2$, for the plane curve

$$\mathbf{R} = 2 \ln t \quad \mathbf{i} - \left(\frac{1}{t} + t\right) \mathbf{j}$$

Find the equation of the circle of curvature when t = 1.

4. Find the velocity and acceleration vectors, the speed ds/dt, and the tangential and normal components of acceleration for the motion described by

$$\mathbf{R} = t\mathbf{i} + \ln t\mathbf{j}$$
 for $t > 0$

- 5. For the curve $\mathbf{R} = (t t^3/3, t^2, t + t^3/3)$, find
 - (a) the unit tangent and normal vectors $\mathbf{T}(t)$ and $\mathbf{N}(t)$ at any point,
 - (b) Now find the curvature $\kappa(t)$,

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- (c) Find the binormal $\mathbf{B}(t)$ and the torsion $\tau(t)$,
- (d) Find the length of the arc of the curve cut off between the planes z = 0 and z = 12.