MATH 213 EXAM I -September 22, 2004

1)For the curve described by the parametric equations $x = 2\sin 4t + 1$, $y = 2\cos 4t + 2$

where $0 \leq t \leq \frac{\pi}{8}$

a)Eliminate the parameter t and sketch the curve showing the motion of the point (x(t), y(t)) as t varies over the given interval

b)Determine the equation of the line tangent to the curve at $t = \frac{\pi}{16}$

2)For the curve described by the parametric equations $x = t^3 + t^2$, $y = \frac{1}{t}$, $1 \leq t \leq 2$

Determine, using the parametric form:

a) The area between the curve and the x-axis

b) Set up (do not solve) the integral for the surface area generated by rotating this curve about the y-axis

3)Determine, for the points P(-1,0,2) , Q(0,1,0) , R(1,2,3)

a)The cosine of the angle between the vectors $\overrightarrow{(RQ)}$ and $\overrightarrow{(PQ)}$

b)The area of the triangle formed by these points

4)Determine, for the plane given by x-2y+z=2

a)The parametric equations of the line perpendicular to the given plane through the point (2,1,2)

b)The equation of the line of intersection of the given plane and the x-y plane (z=0)

c)The cosine of the angle between the given plane and the x-y plane

5)Determine for the velocity vector given by $\mathbf{V} = (3t^2 + 1)\mathbf{i} + e^t\mathbf{j}$

a)The position vector at t=1, given that $\mathbf{R}_0 = \mathbf{i} + \mathbf{j}$ at t=0

b)The acceleration vector at t=1

6)Determine, for the position vector $\mathbf{R} = t^2\mathbf{i} + t^3\mathbf{j} + \cos(t-1)\mathbf{k}$ at t=1

a)The unit tangent vector

b)The curvature