MATH 211 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 $0 \le t \le \frac{\pi}{8}$

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 $x = t^3 + t^2$, $y = \frac{1}{t}$, $1 \le t \le 2$

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 vectors $\mathbf{A}=2\mathbf{i} - \mathbf{j} + 2\mathbf{k}$ and $\mathbf{B}=\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$

a)The vector projection of **B** on **A** (which is a vector in the direction of **A** whose magnitude is the scalar component of **B** along **A**)

b)The altitude of the triangle formed by vectors **A** and **B** (from the tip of vector **B** to the vector **A**)

5)Determine, for the vectors $\mathbf{A} = 5\mathbf{i} - \mathbf{j} - 2\mathbf{k}$, $\mathbf{B} = -\mathbf{i} + 2\mathbf{j} + \mathbf{k}$, $\mathbf{C} = 3\mathbf{i} - 4\mathbf{j} - \mathbf{k}$

a)The triple scalar product $\mathbf{A} \cdot \mathbf{B} \times \mathbf{C}$

b)A unit vector in the direction $(\mathbf{A} - \mathbf{B} - 2\mathbf{C})$

6)Determine the required apparent velocity of a plane which is to fly due west at a speed of 400 mi/hr if it has a tail wind of $\frac{100}{\sqrt{2}}$ mi/hr blowing from the north east.