**MAC 2313 STUDY GUIDE FOR TEST 1**

**1.)** You will be given parametric equations for a curve. Sketch the curve and show its direction. Find the slope of the tangent line to the curve at a given point $(x_0, y_0)$ on the curve. Write an equation of the tangent line to the curve at the point $(x_0, y_0)$. Find the second derivative and discuss concavity at a given point. (Reference: Example 2 on page 720.)

**2.)** Set up an integral for the arc length of a given parametric curve. (Reference: Exercises 43–46 on page 726.)

**3.)** (i) Find the projection of a vector $\vec{u}$ onto a vector $\vec{v}$. (ii) Find the component of $\vec{u}$ in the direction perpendicular to $\vec{v}$. (Reference: Exercises 47–50 on page 788.)

**4.)** Write an equation of the plane that passes through three given points. You must be able to calculate cross product here. (Reference: Example 3 on page 800.)

**5.)** Write parametric equations of a line through a given point and parallel to a given vector. Also, write symmetric equations of the same line. (Reference: Example 1 on page 799.)

**6.)** (i) Find the angle between two planes in the space. (ii) Given two planes that intersect, find the parametric equation of the line of intersection. (Reference: Example 4 on page 801.)

**7.)** Sketch a surface in $\mathbb{R}^3$ whose equation is given. Show the specified cross sections. For instance, what curve do you get when you intersect the surface with the plane $z = 0$? (Reference: Exercises 7, 9, 11 19, 23, 27 on page 818.)

**8.)** Given a plane curve $\vec{r}(t)$, find the unit tangent vector (velocity vector) to the curve at the given point, and a unit normal vector to the curve at the specified point. (Reference: Example 1 on page 857 and Example 3 on page 859.)

**9.)** An applied question on position, velocity, and acceleration. (Reference: Example 4 on page 851; Exercises 19 and 21 on page 854.)

**10.)** Write the equation of a sphere. (Reference: Example 2 on page 774; Exercises 37–40 on page 778.)