Planning your midterm review

- 1. Vectors (12.2-12.4)
 - (a) Computing sum, scalar product, dot product and cross product of vectors.
 - (b) The geometry of sum, scalar product, dot product and cross product of vectors.
 - (c) Applications: Determining when vectors are paralell or perpendicular. Computing angle between them. Areas of parallelograms and triangles. Projections.
- 2. Equations of lines and planes (12.5)
 - (a) You need a point and a direction vector for the vector equation of a line. After finding that, you can convert it to parametric equations or symmetric equations. Two points in space or two intersecting planes determine lines.
 - (b) You need a point and a normal vector for a plane equation. Three (non linear) points, a line and a point not on the line, two parallel lines and two intersecting lines determine planes.
 - (c) Can you compute distances between points, lines and planes using vectors?
- 3. Surfaces in space given by single equations with x, y and z (possibly not all three) (12.6)
 - (a) Planes
 - (b) Generalized cylinders where one of the variables is missing
 - (c) Quadratic surfaces $Ax^2 + By^2 + Cz^2 + Dx + Ey + Fz + G = 0$. You may have to complete the square and rearrange the equation so that you can reference it from the table in Section 12.6 of the textbook.
- 4. Curves and Vector Functions Geometry (13.1)
 - (a) Sketching basic curves and matching pictures for messier ones (by determining which surfaces they sit on)
 - (b) Intersection of curves (use different parameters, for example s and t) versus colliding (when s = t)
 - (c) Intersection of a curve with a surface
 - (d) Intersections of two surfaces gives a curve. We can write parametric equations for that curve. (The parametrization is not unique)
- 5. Curves and Vector Functions Calculus (13.2 and 13.3)
 - (a) Computing $\mathbf{r}'(t)$ and its geometrical interpretation. We always sketch $\mathbf{r}(t)$ starting at the origin and $\mathbf{r}'(t)$ starting at the point of tangency. The first shows the position, the second where it is headed.
 - (b) Finding equations of tangent lines and angles of intersection. See 4(b).
 - (c) Computing arclength and reparametrizing with respect to arclength. Here you will need some integration skills from Math 125. Arclength integrals involve square roots by definition of the length of a vector. Use 4(d) if necessary.
 - (d) Computing the curvature κ .
 - (e) Finding the unit tangent **T** and the unit normal **N** and showing them on the curve. Both are sketched starting at the point of tangency like $\mathbf{r}'(t)$.

Also, look at Chapter 12 Concept Check and True-False questions, Chapter 13 Concept Check (1-6) and True-False (except 8 and 18) questions.

Look at old midterm questions for practice. Some midterms may contain questions from 13.4 about acceleration. Ignore those.