Midterm Review #2 - Math 275

Midterm #2 will cover material from Chapter 12.3 through Chapter 13.3 (except 12.6). In particular, you should be able to do the following:

1. Find the angle between two vectors \( \mathbf{u} \) and \( \mathbf{v} \).
2. Find unit vectors in the direction of \( \mathbf{u} \) and \( \mathbf{v} \).
3. Find the projection \( \mathbf{u}_\parallel \) of \( \mathbf{u} \) onto \( \mathbf{v} \).
4. Find the projection \( \mathbf{v}_\parallel \) of \( \mathbf{v} \) onto \( \mathbf{u} \).
5. Decompose \( \mathbf{u} \) as \( \mathbf{u} = \mathbf{u}_\parallel + \mathbf{u}_\perp \).
6. Decompose \( \mathbf{v} \) as \( \mathbf{v} = \mathbf{v}_\parallel + \mathbf{v}_\perp \).
7. Compute \( \mathbf{w} = \mathbf{u} \times \mathbf{v} \).
8. Compute \( \| \mathbf{u} \times \mathbf{v} \| \). How is the magnitude of the cross product related to the magnitudes of \( \mathbf{u} \), \( \mathbf{v} \) and the angle between \( \mathbf{u} \) and \( \mathbf{v} \)?
9. For \( \mathbf{w} = \mathbf{u} \times \mathbf{v} \), what is \( \mathbf{u} \cdot \mathbf{w} \) and \( \mathbf{v} \cdot \mathbf{w} \)?
10. Know the basic properties for both the dot product and the cross product.
11. Know how to compute the equation of a plane given three points.
12. Know how to find a plane parallel to a given plane.
13. Compute the angle between two planes.
14. Extra credit: Find the parametric equations for the intersection of two planes.
15. Cylindrical and spherical coordinates.
16. Draw tangent vectors to a plane curve (i.e. a curve in a two dimensional plane).
17. Give a parameterization of of the curve at the intersection of the surface \( x^2 + y^2 = R^2 \) and a plane. What kind of curve do you get?
18. Be able to find the path traced out by a curve, given the tangents to the curve, and a point on the curve.
19. Compute an arc-length parameterization of simple curves parameterized by \( \mathbf{r}(t) \).
20. Determine whether a given parameterization is an arc-length parameterization.