Explain your answers with neat sketches whenever possible. If not clearly stated, assume that all computations are made on Helmert1906 (a = 6378.2 km, $f = \frac{1}{298.3}$). Also, mean radius of the earth is R = 6371 km.

Assignment (3)

1. Discuss the common curves that can be found on the surface of an ellipsoid. Explain the properties and characteristics of each of these curves.
2. What is a normal section on the surface of an ellipsoid? How is it determined, and what are its properties?
3. Define a geodesic line curve on the surface of an ellipsoid. Explain its significance and how it differs from other types of curves.
4. What are the radii of curvature on an ellipsoid? Discuss their role in measuring the curvature of the surface. Explain how the radii of curvature depend on the direction of curvature and provide examples to illustrate this concept.
5. Explain using only equations how to calculate the lengths of different types of arcs on the surface of an ellipsoid.
6. Explore the practical applications of understanding the types of curves on an ellipsoid. Provide examples of how this knowledge is utilized in the field of geodesy.
7. Calculate the radii of curvature M and N at latitudes of -10 degrees, 0 degrees, and 10 degrees.
8. Calculate the radii of curvature at the equator (latitude of 0 degrees) and at the poles (latitude of 90 degrees). Comment on the results.
9. Calculate the radius of curvature at an azimuth of 60 degrees at latitudes of 40 and 60 degrees.
10. Calculate the length of the meridian arc between latitudes 30 degrees and 45 degrees. Also, calculate the length of a parallel arc at latitude 35 degrees between longitudes -60 degrees and 60 degrees.
11. If Earth is modeled as a sphere, calculate the length of a parallel arc at latitude 40 degrees between longitudes -30 degrees and 30 degrees. Also, calculate the length of the meridian arc between latitudes 20 degrees and 60 degrees.