Question 1: (20 points) Derive the equations for:
(a) A conical map projection with the axis of the cone along the Z-axis, tangent at latitude $\phi_c$ and cut at longitude 180°. Assume latitude and longitude on a spherical Earth are to be projected and that the origin of the projection is the center of the Earth.

(b) A plane projection tangent at the North Pole with the X-axis along the Greenwich meridian.

Question 2: (50 points) For the following triangle defined by latitudes and longitudes:
Point A  latitude 70°, longitude 0°
Point B  latitude 13.17944°, longitude -30.89897°
Point C  latitude 13.17944°, longitude 30.89897°

Project these points and some intermediate points on the great circles connecting them with
(a) A Mercator map projection; tangent at the equator, axis along the Z-axis and cut at 180° longitude;
(b) A conical map projection with the axis of the cone along the Z-axis, tangent at latitude 42.632195° and cut at longitude 180°
(c) A plane projection tangential at the North Pole with the X-axis along the Greenwich meridian.