Question 1. Given the geodetic coordinates of the peak of Mt Everest as Latitude \( L_b \) 27 deg 59 min 16 sec N, Longitude \( \gamma_b \) 86 deg 56 min 40 sec E, and height \( h_b \) 8850 meters (derived by GPS in 1999):

a) Develop a MATLAB function “function \([r_e e b]\) = llh2xyz(L_b, lambda_b, h_b)” to convert from geodetic curvilinear lat, lon, and height to ECEF rectangular x, y, & z coordinates (Please use SI units).

   i. Test your llh2xyz function using coordinates of the peak of Mt Everest?

b) Develop a MATLAB function “function \([L_b, lambda_b, h_b]\) = xyz2llh(r_e e b)” to convert ECEF x, y, & z coordinates to lat, lon, & height (Please use SI units). HINT: This should be an iterative transformation (i.e. not closed form).

   i. Test your xyz2llh function with the ECEF cords obtained from part a) i. Tabulate the error in lat (in deg), lon (in deg), & height (in m) for 1 to 10 iterations.

c) What is the acceleration due to gravity at the ellipsoid (i.e. at the ellipsoid \( h_b = 0 \))? HINT: This should only be a function of lat)?

d) What is the magnitude of the centrifugal acceleration \( -\Omega^2 e e b \) at the ellipsoid and at the peak?

e) What is the magnitude of the gravitational attraction at the ellipsoid and at the peak? HINT: You can use Eqn. 2.91 to compute \( \gamma e b = \gamma e b |_{e b} \).

f) BONUS QUESTION: Use the work you did for parts d) and e) to determine the acceleration due to gravity at the ellipsoid (HINT: You need vectors now). How does this compare with the answer which you got in part c) (i.e. compute the difference in \( \mu m/s^2 \)).

Question 2. Develop a MATLAB function “function \([g_n bD]\) = gravity(L_b, h_b)” (see eqn. 2.90 on page 48 of Groves) to approximate the “down” component of the acceleration due to gravity as a function of lat & height (Please use SI units).

a) Use this function to compute the acceleration due to gravity at the peak.

b) What is the difference in m/s\(^2\) between the answer obtained in Question 2 a) and that of 1 c) ?

   i. Based on this difference how much less would you weigh at the peak than at the ellipsoid (in lbs)?