$\phi, \lambda, h \rightarrow X, Y, Z$ (ECEF)

$$X = (N+h)\cos\phi\cos\lambda$$
$$Y = (N+h)\cos\phi\sin\lambda$$
$$Z = [N(1-e^2)+h]\sin\phi$$

N = radius of curvature in prime Vertical

$$N = \frac{a}{(1-e^2\sin^2\phi)^{1/2}}$$

WGS84: $a = 6378137.0$ m

$1/f = 298.257223563$

$e^2 = 2f - f^2$

inverse $XYZ \rightarrow \Phi \lambda h$

$\tan \lambda = Y/X$ (resolve quadrant)

(Leick p. 371)

$$\Phi_{initial} = \tan^{-1}\left[\frac{Z}{(1-e^2)\sqrt{X^2+Y^2}}\right]$$

$$\tan\Phi = \frac{Z}{\sqrt{X^2+Y^2}}\left(1 + \frac{e^2 N \sin\Phi}{Z}\right)$$

loop until no change in Φ

$$h = \frac{\sqrt{X^2+Y^2}}{\cos\Phi} - N$$

REF. BOOKS FOR GPS

1. GPS Satellite Surveying, 3rd edition
   Leick, Wiley, 2004

2. A software defined GPS and GALILEO
   Receiver, Borre, Akos, ..., Birkhauser,
   2007 (receiver in Matlab code)

3. Fundamentals of Global Positioning
   System Receivers, A Software Approach
   - Tsui, Wiley, 2000

Remainder of session 28 on
STARNET Demo & comparison to Matlab
solution of HW4 – see slides.