

GEODETIC TO ECEF COORDINATES (DIRECT) -  
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**Given ellipsoid "a" and "f"**

**Given Latitude, Longitude, Ellipsoidal Height ( $\lambda, \varphi, h$ ), get  
 $X, Y, Z$**

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

$$w = \sqrt{1 - e^2 * \sin^2(\varphi)}$$

$$R_N = \frac{a}{w}$$

$$X = (R_N + h)\cos(\varphi)\cos(\lambda) \quad \# \text{ West longitudes are negative}$$

$$Y = (R_N + h)\cos(\varphi)\sin(\lambda)$$

$$Z = \{(1-e^2)R_N+h\}\sin(\varphi) \quad \# \text{ Southern Z are negative}$$