11 $\vec{V}\Big|_{\text{inertial}} = \dot{\vec{r}} + \overrightarrow{\Omega \times r}$

$T = \frac{1}{2} m V^2_{\text{inert}} = \frac{1}{2} m \left[\dot{\vec{r}} + \overrightarrow{\Omega \times r} \right]^2 = \frac{1}{2} m \left[\dot{\vec{r}}^2 + 2 \dot{\vec{r}} \cdot \overrightarrow{\Omega \times r} + \overrightarrow{\Omega \times r}^2 \right]$

or $\dot{\vec{r}} \times \Omega \cdot r$

$U = U(\vec{r})$

$\frac{\partial L}{\partial \vec{r}} = -\nabla U + m \dot{\vec{r}} \times \Omega + \frac{\partial}{\partial r} \frac{1}{2} m (\Omega \times r)^2$

$(\Omega \times r) \cdot (\Omega \times r) = \Omega \cdot (r \times \Omega \times r)$

$= -\nabla U + m \dot{\vec{r}} \times \Omega + m(\Omega \times \overrightarrow{r \times \Omega})$

$= \Omega^2 r^2 - (\Omega \cdot r)^2$

$\frac{\partial}{\partial r} \Rightarrow 2\Omega^2 \vec{r} - 2(\Omega \cdot r)\vec{\Omega}$

$= 2(\Omega \times (\overrightarrow{r \times \Omega}))$

$\frac{\partial L}{\partial \dot{r}} = m \dot{\vec{r}} + m \overrightarrow{\Omega \times r}$

$\frac{d}{dt} \frac{\partial L}{\partial \dot{\vec{r}}} = m \ddot{\vec{r}} + m \vec{\Omega} \times \dot{\vec{r}}$

$-\nabla U + m \dot{\vec{r}} \times \Omega + m(\Omega \times \overrightarrow{r \times \Omega}) = m \ddot{\vec{r}} - m \dot{\vec{r}} \times \Omega$

$\Rightarrow -\nabla U + 2m \dot{\vec{r}} \times \Omega + m \underbrace{(\Omega \times \overrightarrow{r \times \Omega})}_{\overrightarrow{\Omega \times r} \times \Omega} = m \ddot{\vec{r}}$ ✓ 9.34

26 Zero order: $\vec{r} = (v_{0x} t,\ v_{0y} t,\ v_{0z} t - \frac{1}{2} g t^2)$

$$\begin{cases} \ddot{x} = 2\Omega(v_{0y} \cos\theta - (v_{0z} - gt)\sin\theta) \\ \ddot{y} = -2\Omega v_{0x} \cos\theta \\ \ddot{z} = -g + 2\Omega v_{0x} \sin\theta \end{cases}$$

$$\begin{cases} \dot{x} = v_{0x} + 2\Omega(v_{0y} \cos\theta\, t - (v_{0z} t - \frac{1}{2} g t^2)\sin\theta \\ \dot{y} = v_{0y} - 2\Omega v_{0x} \cos\theta\, t \\ \dot{z} = v_{0z} - gt + 2\Omega v_{0x} \sin\theta\, t \end{cases}$$

$x = x_0^{\to 0} + v_{0x} t + 2\Omega(v_{0y} \cos\theta \frac{t^2}{2} - (v_{0z} \frac{t^2}{2} - \frac{1}{6} g t^3)\sin\theta$

$y = y_0^{\to 0} + v_{0y} t - \Omega v_{0x} \cos\theta\, t^2$

$z = v_{0z} t - \frac{1}{2} g t^2 + \Omega v_{0x} \sin\theta\, t^2$

28) due east $\Rightarrow v_{oy} = 0$ $\quad v_{ox} = v\cos\alpha$ $\quad v_{oz} = v\sin\alpha$

$R = \frac{v^2}{g}\sin 2\alpha$ $\quad t = 2\frac{v_{oz}}{g} = \frac{2v\sin\alpha}{g}$

$= 16.4\,km$ $\quad = 34.9\,sec$

$v = 500\,m/s$

$\alpha = 20°$

$(1-\cos^2\alpha)$

$y = -\Omega v_{ox} \overset{\cos}{\cancel{\sin}}\theta\, t^2 = -\Omega \frac{2^2 v_{ox} v_{oz}^2}{g^2}\cos\theta = -\Omega\, 4\frac{v^3}{g^2}\cos\alpha\sin^2\alpha\cos\theta$

$\cos\theta$ & $\cos(180-\theta)$ are $\pm$ each other.

$= \frac{2\pi}{24\cdot 3600}\cdot 4\cdot\frac{500^3}{9.8^2}\cos(\underset{20}{\alpha})\sin^2\alpha\cos 40 = \underline{\pm 31.9\,m}$

goes south to north