Central-force motion

$$
\vec{a}=(\ddot{r}-r \ddot{\theta}) \vec{e}_{r}+(\ddot{r} \ddot{\theta}+2 \dot{r} \dot{\theta}) \vec{e}_{\theta}
$$


14.41

$$
\phi_{s}=70^{\circ}
$$

$$
a_{s}=5000 \mathrm{mi}
$$

$R=3960 \mathrm{mi}$
$i_{s}=3.2 \mathrm{mi} / \mathrm{s}$
$a_{\text {max }}=$ ? $\quad a_{\text {min }}=$ ?
$R=3960 \mathrm{~m}$
(mi) (2)


Frictionaen

$$
v_{2}=? \quad d_{1}=?
$$

The not force attis on the disk in a central force.

$$
\begin{align*}
& h_{1}=h_{2} \quad 2\left(G \sin 60^{\circ}\right)=1.2\left(v_{2}\right)\left(\frac{d k}{1.2}\right)  \tag{1}\\
& \sin \phi=\frac{d_{k}}{1.2} \quad\left(V_{e}=\frac{1}{2} k x^{2}\right) \\
& T_{1}+v_{1}=T_{2}+v_{2} \quad \frac{1}{2}(0.4)(6)^{2}+\frac{1}{2}(100)(2-1.2)^{2} \\
&  \tag{2}\\
&
\end{align*}
$$

$$
\therefore v_{2}=\square, \quad d_{2}=\square \quad v_{2}=\square \mathrm{m} / \mathrm{R} \quad d_{1}=\square \mathrm{m}
$$

$$
\begin{aligned}
& h_{s}=h_{p} \quad r_{s}\left(v_{s}\right)_{\theta}=r_{p}\left(v_{p}\right)_{2 e e} \quad r_{s}=R+a_{s}=3960+5000 \\
& 8960\left(3.2 \sin 70^{\circ}\right)=r_{E} V_{E} \\
& T_{S}+V_{S}=T_{E}+V_{E} \quad V_{g}=-\frac{G M m}{r} \quad \text { (resp.579) } \\
& \frac{1}{2} m(3.2)^{2}-\frac{G M \text { m }}{8960}=\frac{1}{2} m V_{E}^{2}-\frac{G M m}{r_{E}} \\
& G M=g R^{2}=\frac{32.2}{5280}(3960)^{2} \\
& \square r_{E}^{2}+\square r_{E}+\square=0 \quad r_{E}=\left\{\begin{array}{l}
\square=r_{p} \\
\square=r_{Q}
\end{array}\right. \\
& a_{\text {max }}=r_{Q}-R \quad a_{\text {min }}=r_{p}-R \quad a_{\max } \overline{\bar{L}} \quad a_{\text {min }}=a_{\text {xiv }} \\
& 14.47 \\
& \overline{O P_{1}}=2 \mathrm{~m} \\
& L=1.2 \mathrm{~m} \\
& \mathrm{k}=100 \mathrm{~N} / \mathrm{m} \\
& m=0.4 \mathrm{~kg} \\
& \vec{v}_{1}=6 \vec{j} \mathrm{~m} / \mathrm{R}
\end{aligned}
$$

