1.
$$s = r\theta$$
$$\frac{s}{r} = \theta$$
$$\frac{8.29 \times 10^6}{6.18 \times 10^6} = \theta$$
$$1.34 \text{ rad} = \theta$$

2. $\Delta t = 9.09 \ \cancel{\text{hr}} \left(\frac{60 \ \cancel{\text{min}}}{1 \ \cancel{\text{hr}}} \right) \left(\frac{60 \text{ s}}{1 \ \cancel{\text{min}}} \right) = 32{,}724 \text{ s}$

$\omega = ?$

$$\omega = \frac{\theta}{\Delta t} = \frac{1.34 \text{ rad}}{32{,}724 \text{ s}} = 4.09 \times 10^{-5} \text{ rad/s}$$

3.
$$v_1 = \frac{2\pi r}{T} \qquad\qquad v_2 = \frac{2\pi(r+d)}{T}$$
$$Tv_1 = 2\pi r \qquad\qquad Tv_2 = 2\pi(r+d)$$
$$\frac{Tv_1}{2\pi} = r \qquad\qquad \frac{Tv_2}{2\pi} - d = r$$
$$\frac{Tv_1}{2\pi} = \frac{Tv_2}{2\pi} - d$$
$$d = \frac{Tv_2}{2\pi} - \frac{Tv_1}{2\pi}$$
$$d = \frac{T}{2\pi}(v_2 - v_1)$$
$$\frac{2\pi d}{T} = \Delta v$$
$$\frac{2\pi(328)}{86,400} = \Delta v$$
$$0.02385 = \Delta v$$
$$2.39 \times 10^{-2} \text{ m/s} = \Delta v$$

4. $v = \dfrac{2\pi d}{T}$

$$v = \frac{2\pi r \cos\theta}{T}$$
$$v = \frac{2\pi(6.37 \times 10^6)\cos 40.1}{86,400 \text{ s}}$$
$$v = 354.34 \text{ m/s}$$

5.
$$T_2 \cos \theta_2 = T_1 \cos \theta_1$$
$$T_2 = \frac{T_1 \cos \theta_1}{\cos \theta_2}$$
$$T_1 \sin \theta_1 + \left(\frac{T_1 \cos \theta_1}{\cos \theta_2} \right) \sin \theta_2 = 350$$
$$T_1 \sin \theta_1 + \frac{T_1 \cos \theta_1 \sin \theta_2}{\cos \theta_2} = 350$$
$$T_1 \sin \theta_1 + T_1 \frac{\cos \theta_1 \sin \theta_2}{\cos \theta_2} = 350$$
$$T_1 \left(\sin \theta_1 + \frac{\cos \theta_1 \sin \theta_2}{\cos \theta_2} \right) = 350$$
$$T_1 \left(\frac{\sin \theta_1 \cos \theta_2 + \cos \theta_1 \sin \theta_2}{\cos \theta_2} \right) = 350$$
$$T_1 \left(\frac{\sin (\theta_1 + \theta_2)}{\cos \theta_2} \right) = 350$$
$$T_1 = 350 \left(\frac{\cos \theta_2}{\sin (\theta_1 + \theta_2)} \right)$$
$$T_1 = \frac{350 \cos \theta_2}{\sin (\theta_1 + \theta_2)}$$
$$T_1 = \frac{350 \cos 23.8}{\sin (55.3 + 23.8)}$$
$$T_1 = \frac{350 \cos 23.8}{\sin (79.1)}$$
$$T_1 = 326.12 \text{ N}$$

6.
$$T_1 \sin \theta_1 = 350 - T_2 \sin \theta_2$$

$$T_1 = \frac{350 - T_2 \sin \theta_2}{\sin \theta_1}$$

$$-\left(\frac{350 - T_2 \sin \theta_2}{\sin \theta_1}\right) \cos \theta_1 + T_2 \cos \theta_2 = 0$$

$$-\left(\frac{350 \cos \theta_1 - T_2 \sin \theta_2 \cos \theta_1}{\sin \theta_1}\right) + T_2 \cos \theta_2 = 0$$

$$\frac{-350 \cos \theta_1 + T_2 \sin \theta_2 \cos \theta_1}{\sin \theta_1} + T_2 \cos \theta_2 = 0$$

$$\frac{-350 \cos \theta_1}{\sin \theta_1} + \frac{T_2 \sin \theta_2 \cos \theta_1}{\sin \theta_1} + T_2 \cos \theta_2 = 0$$

$$\frac{-350 \cos \theta_1}{\sin \theta_1} + T_2 \left(\frac{\sin \theta_2 \cos \theta_1}{\sin \theta_1} + \cos \theta_2\right) = 0$$

$$T_2 \left(\frac{\sin \theta_2 \cos \theta_1}{\sin \theta_1} + \cos \theta_2\right) = \frac{350 \cos \theta_1}{\sin \theta_1}$$

$$T_2 \left(\frac{\sin \theta_2 \cos \theta_1 + \cos \theta_2 \sin \theta_1}{\sin \theta_1}\right) = \frac{350 \cos \theta_1}{\sin \theta_1}$$

$$T_2 \left(\frac{\sin (\theta_2 + \theta_1)}{\sin \theta_1}\right) = \frac{350 \cos \theta_1}{\sin \theta_1}$$

$$T_2 = \frac{350 \cos \theta_1}{\sin \theta_1} \left(\frac{\sin \theta_1}{\sin (\theta_2 + \theta_1)}\right)$$

$$T_2 = \frac{350 \cos \theta_1}{\sin (\theta_2 + \theta_1)}$$

$$T_2 = \frac{350 \cos 55.3}{\sin (23.8 + 55.3)}$$

$$T_2 = 203 \text{ N}$$