PROB. 13-87

$$v_A = \left(20.2\times10^3 \frac{mi}{HR}\right)\left(\frac{HR}{3600\,s}\right)\left(\frac{5280\,ft}{mi}\right) = 2.963\times10^4\ \frac{ft}{s}$$

$$r_A = (3960 + 2700\ mi)\left(\frac{5280\,ft}{mi}\right) = 3.516\times10^7\ ft$$

$$r_B = (3960 + 7900\ mi)\left(\frac{5280\,ft}{mi}\right) = 6.262\times10^7\ ft$$

$$R = (3960\ mi)\left(\frac{5280\,ft}{mi}\right) = 2.091\times10^7\ ft$$

FIND v_B:

$$T_A + V_A = T_B + V_B$$

$$\frac{1}{2}mv_A^2 - \frac{gR^2m}{r_A} = \frac{1}{2}mv_B^2 - \frac{gR^2m}{r_B}$$

$$\frac{1}{2}v_B^2 = \frac{1}{2}v_A^2 + gR^2\left(\frac{1}{r_B} - \frac{1}{r_A}\right)$$

$$v_B = \sqrt{v_A^2 + 2gR^2\left(\frac{1}{r_B} - \frac{1}{r_A}\right)}$$

$$v_B = \sqrt{\left(2.963\times10^4\ \frac{ft}{s}\right)^2 + 2\left(32.2\ \frac{ft}{s^2}\right)\left(2.091\times10^7\ ft\right)^2 \cdot\left[\frac{1}{(6.262\times10^7\ ft)} - \frac{1}{(3.516\times10^7\ ft)}\right]}$$

$$v_B = \left(2.295\times10^4\ \frac{ft}{s}\right)\left(\frac{3600\,s}{HR}\right)\left(\frac{mi}{5280\,ft}\right) =$$

$$\boxed{= 1.565\times10^4\ \frac{mi}{HR}}$$