3) $r_p = 10000\,km$ ^ $r_a = 100000\,km$

$$e = \frac{r_a - r_p}{r_a + r_p} = \frac{90000}{110000} = 0,8182$$

$e = 0,8182 \rightarrow (a)$

$$a = \frac{r_a + r_p}{2} = \frac{110000}{2}\,km = 55000\,km$$

$a = 55000\,km \rightarrow (b)$

$$T = 2\pi\sqrt{\frac{a^3}{\mu}} = 2\pi\sqrt{\frac{(55000\,km)^2\ s^2}{398600,4418\,km^3}} \cong 128368\,s$$

$T = 35,66\ horas \rightarrow (c)$

$$\epsilon = -\frac{\mu}{2a} = -\frac{398600,4418}{2.55000\,km}\,\frac{km^3}{s^2} = -3,624\,\frac{km^2}{s^2}$$

$\epsilon = -3,624\,\frac{km^2}{s^2} \rightarrow (d)$

$r = h + R_T$ con $h = 10000\,km$ ^ $R_T = 6378\,km$

$r = 16378\,km \rightarrow$ ~~$r = \frac{a(1-e^2)}{1+e\cos(\nu)}$ con $\nu = ?$~~

~~$r\cos(\nu) + re = a(1-e^2)$~~

$$r = \frac{a(1-e^2)}{1+e\cos(\nu)} \Rightarrow \cos(\nu) = \frac{a(1-e^2) - r}{e \cdot r}$$

$$\nu = \cos^{-1}\left[\frac{a(1-e^2) - r}{e \cdot r}\right] = 82,27°$$

$\nu = 82,27° \rightarrow (e)$

$$h = \sqrt{\mu p} = \sqrt{\mu a (1 - e^2)} = 85127,13 \frac{km^2}{s}$$

$$v_r = \frac{\mu}{h} e \operatorname{sen}(\nu) = 3,80^{*} \frac{km}{s}$$

$$v_T = \frac{\mu}{h} (1 + e \cos(\nu)) = 5,16 \frac{km}{s}$$

$v_r = 3,80 \frac{km}{s}$ ^ $v_T = 5,16 \frac{km}{s}$ → (f)

$$v_a = \frac{h}{r_a} = \frac{85127,13}{100000} \frac{km}{s} = 0,85 \frac{km}{s}$$

$$v_p = \frac{h}{r_p} = \frac{85127,13}{10000} \frac{km}{s} = 8,51 \frac{km}{s}$$

$v_a = 0,85 \frac{km}{s}$ ^ $v_p = 8,51 \frac{km}{s}$ → (g)