Bac 2019 Fysik

Del A

a) $\frac{T^2}{r^3}$

Planet b:
m=1.02*jordmassan
r=1.73*10^6 Km
T=1.51 d

$$\frac{1.51^2}{1.73^3} = 0.44$$

Planet c:
m=1.16*jordmassan
r=2.37*10^6 Km
T=2.42 d

$$\frac{2.42^2}{2.37^3} = 0.44$$

b) Planet e:
m=0.77
r=4.38*10^9 m
T=6.10

$$T = 6.10\ d = (6.10 * 24 * 60 * 60)s = 527040s$$

$$O = 2\pi r$$

$$v_e = \frac{O}{T} = \frac{2\pi 4.58 * 10^9}{527040} = 52216,8\ m/s\ \approx\ 5.2 * 10^4\ m/s$$

c)

$$\frac{T^2}{r^3} = 0.44$$

$$\frac{v_1}{v_2} = \frac{\frac{2\pi r_1}{T_1}}{\frac{2\pi r_2}{T_2}}\ \rightarrow\ \frac{r_1}{T_1} * \frac{T_2}{r_2}$$

$$\frac{v_1}{v_2} = \sqrt{\frac{r_2}{r_1}}$$

$$\frac{r_1}{T_1} * \frac{T_2}{r_2} = \sqrt{\frac{r_2}{r_1}}$$

Kvadrering:

$$\frac{r_1^2}{T_1^2} * \frac{T_2^2}{r_2^2} = \frac{r_2}{r_1} \qquad | * r_1 \quad |/r_2$$

$$\frac{r_1^3}{T_1^2} * \frac{T_2^2}{r_2^3} = 1\ \rightarrow\ \frac{r^3}{T^2} * \frac{T^2}{r^3}$$

d) Planet "e" är 1, den okända planeten är 2.

$$\frac{v_1}{v_2} = \sqrt{\frac{r_2}{r_1}}$$

$$\frac{5.22}{4.13} = \sqrt{\frac{r_2}{4.38}}$$

$$\frac{5.22^2}{4.13^2} = \frac{r_2}{4.38}$$

$$r_2 = \frac{5.22^2}{4.13^2} * 4.38 = 6.997 \ * 10^6 \ Km$$

Den okända planeten är planet g, som har en banradie på $7.01 * 10^6 \ km$

e) i. $F_c = F_g$

$$F_g = G * \frac{M * m}{r^2}$$

$$F_c = \frac{M * v^2}{r}$$

$$\frac{M * v^2}{r} = G * \frac{M * m}{r^2}$$

?

$$E_{tot} = -G\frac{mM}{2r}$$

ii. $E_{tot} = -G\frac{mM}{2r}$

$$1.77 * 10^{29} * 0.77 * 5.97 * 10^{24}$$

$$E_{tot} = -6.67 * 10^{-11} * \frac{1.77 * 10^{29} * 0.77 * 5.97 * 10^{24}}{2 * 4.38 * 10^9}$$

$$E_{tot} = 6.19 * 10^{33} \ J$$