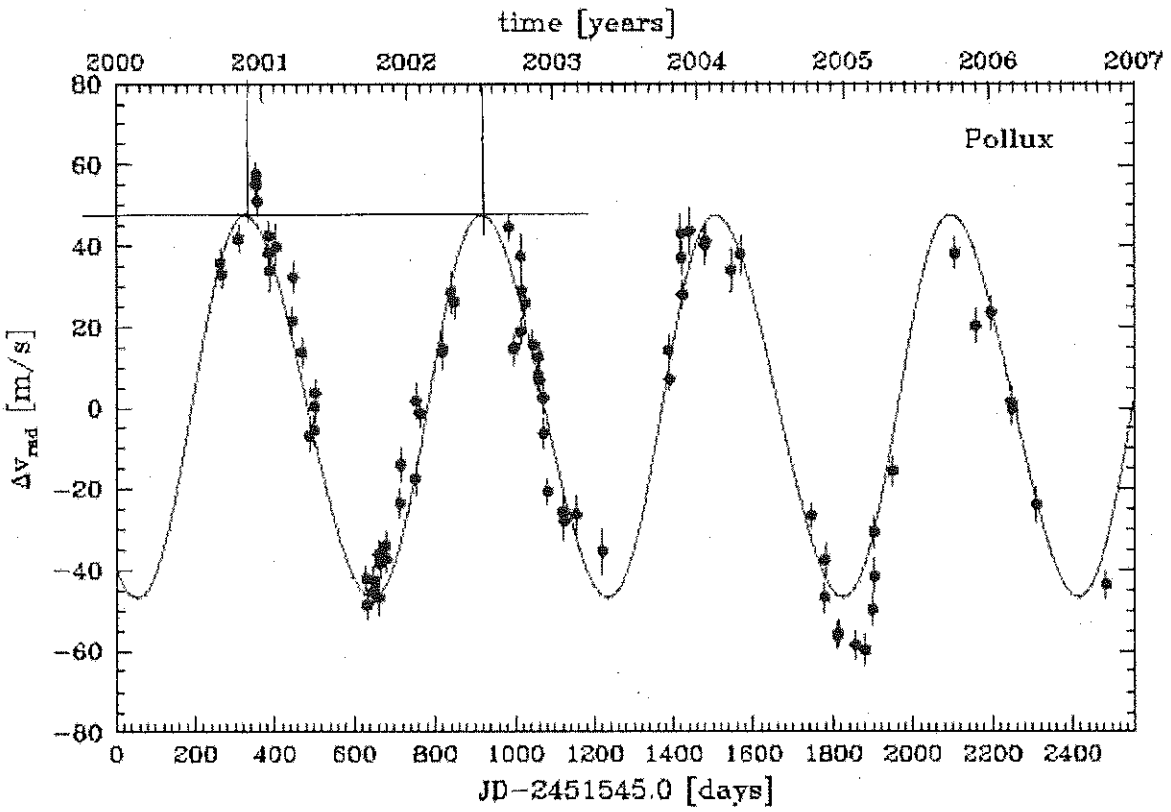
Astronomy 1102/1104 Name: Answer Key

Spring 2016 - Section Assignment 4 Section # _____



1)The graph above shows a radial velocity curve of a star.

a) How many planets are orbiting this star? 1

b) What is the period of the planet(s)? 1 year 7 months ~ 1.58 years

c) What is the distance of the planet from the star, assume Mstar =2Msun?

$P^2 = \frac{a^3}{2}$ $\quad a = \sqrt[3]{2P^2} = \sqrt[3]{2(1.58)^2} \approx 1.7\,AU$

d) What is the speed of the planet's orbit?

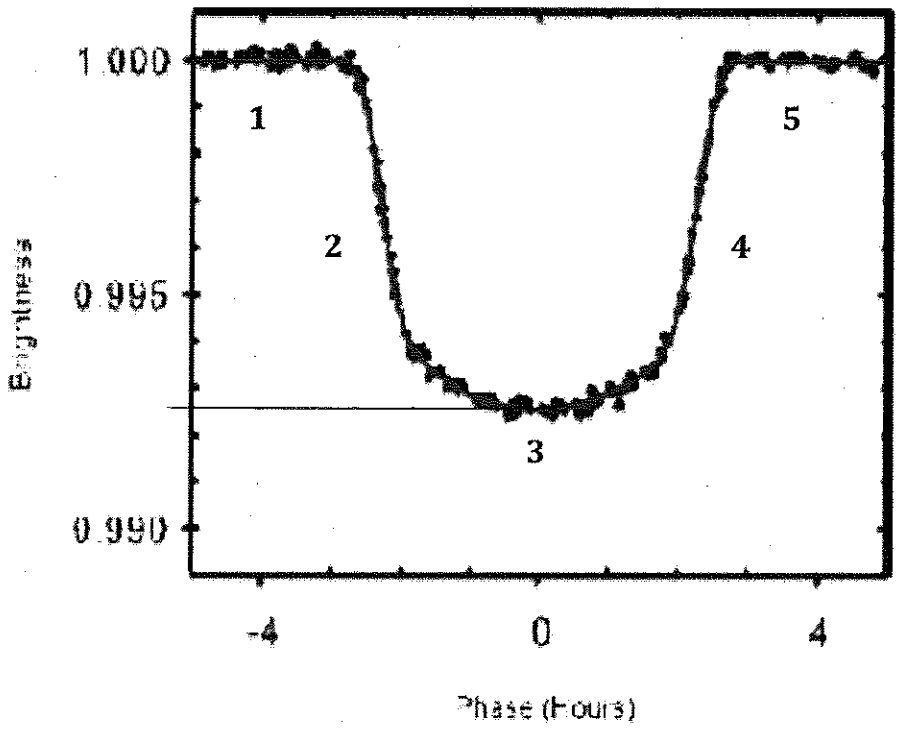
$v = \frac{2\pi a}{P} \approx 6.76\,AU/year \sim 32\,km/s$

e) What is the speed of the star's orbit? 47 m/s

f) If Vstar/Vplanet=Mplanet/Mstar what is Mplanet?

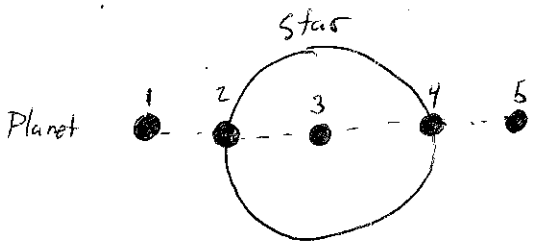
$M_{planet} = M_{star}\left(\frac{V_{star}}{V_{planet}}\right) = 2M_\odot\left(\frac{47\,m/s}{32\times10^3\,m/s}\right) \sim 0.003M_\odot$

$\sim 3.1\,M_{Jupiter}$



2) here we see a transit curve of a planet orbiting a star.

a) Draw a picture to show what is happening at each numbered part of the graph.



b) if the brightness change is proportional to (Rplanet/Rstar)^2 and Rstar is roughly 10^6km what is Rplanet?

$$\Delta B \sim 0.0075 = \left(\frac{R_{planet}}{R_{star}}\right)^2$$

$$R_{planet} = \sqrt{R_{star}^2 (0.0075)} \sim 86 \times 10^3 \text{ km} \sim$$

$\sim 0.1 R_{pluto}$