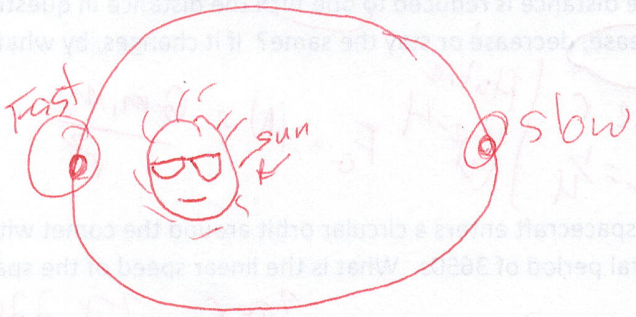
Honors Physics — Unit 7 Practice Test

Mr. McQuiston — Name:_____

8. What is the value of the comet's gravitational field where the spacecraft is orbiting the comet?

$$g = \frac{GM}{r^2} = 0.0065\ m/s^2$$

9. Draw the comet's orbit around the sun.
   a. Label the sun.
   b. Where the comet is closest to the sun and furthest from the sun.
   c. Where the comet has the greatest, slowest linear speed.



10. Using kepler's constant $k=T^2/R^3=4\pi^2/Gm$. And the sun's mass=1.99×10^{30}kg. Find the comet's average orbital radius if it's period of revolution is 589 days.

$$\frac{T^2}{R^3} = \frac{4\pi^2}{Gm}$$

$$R = \sqrt[3]{\frac{GmT^2}{4\pi^2}}$$

589 days = 50,889,600 s

$$= \sqrt{\frac{6.67\times10^{-11}\times1.99\times10^{30}\times50889600^2}{4\pi^2}}$$

$$= 7\times10^{11}\ m$$

11. Find the comet's linear speed around the sun at this radius.

$$V = \frac{2\pi r}{T} = \frac{2\pi(7\times10^{11})}{50889600} = 86{,}446\ m/s$$

12. At its closest, the comet comes within 5×10^9m from the sun. What gravitational force acts on it at this position?

$$F_G = \frac{G m_{sun} m_{comet}}{r^2} = \frac{6.67\times10^{-11}\times1.99\times10^{30}\times4.72\times10^{14}}{(5\times10^9)^2} = \frac{6.26\times10^{34}}{2.5\times10^{19}}$$

$$= 2.5\times10^{15}\ N$$

13. What is the comets linear speed at a radius of 5×10^9m?

The grav. force acts centripetally so $F_G = F_c$

$$2.5\times10^{15} = \frac{m_{comet} v^2}{r}$$

$$\frac{2.5\times10^{15}\cdot5\times10^9}{4.72\times10^{14}} = v^2$$

$$v^2 = 2.65\times10^{10}$$

$$v = \sqrt{2.65\times10^{10}}$$

$$v = 162{,}736\ m/s$$