Problems of the Week 12

Always show your work to receive credit (NO WORK=NO CREDIT)

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1. A particle of mass m is subject to an attractive force $F=-c/r^2$ ($U=-c/r$) where c is a constant. The particle is in a closed orbit. Its velocity at one of its extreme positions a distance b from the center of force is $(c/2mb)^{1/2}$. What is its velocity at the other extreme position?
   a. 0 b. $3(c/2mb)^{1/2}$ c. 5c/4mb c. 2c/mb e. $(2c/mb)^{1/2}$

2. Two planets in a different solar system orbit each other similar to the Earth-Moon system. One planet is of mass $M_1=4M$ and radius R_1. The other planet is of mass $M_2=M$. You want to launch a vehicle so that it travels from M_1 to M_2. What is the minimum initial speed required to accomplish this feat? Assume the distance between the planets is d, and $R_1=d/10.0$. Ignore any affects due to other planets.

   a. $8.01\left(\frac{GM}{d}\right)^{\frac{1}{2}}$

   b. $9.17\left(\frac{GM}{d}\right)^{\frac{1}{2}}$

   c. $10.5\left(\frac{GM}{d}\right)^{\frac{1}{2}}$

   d. $14.4\left(\frac{GM}{d}\right)^{\frac{1}{2}}$

   e. $16.3\left(\frac{GM}{d}\right)^{\frac{1}{2}}$

3. A 2.0 m long uniform rod of mass 1.0kg lies along the x-axis. Calculate the gravitational field strength at the point P on the y-axis.

a. G b. .71G c. 0.50G c. 0.25G d. 0.17G e. 0.11G