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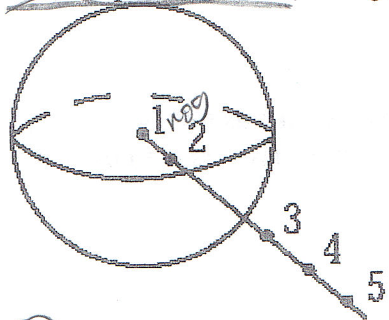
4 1. Test masses are used to measure the gravitational field at various positions in and near a *~~hollow spherical shell~~*. The gravitational field will have its greatest value at point(s)



A) 3
B) 4
C) 5
~~D)~~ 1, 2, and 5
~~E)~~ 1 and 2

4 2. The mass density of a planet varies with distance from the center as $\rho = \rho_o(1 - C\frac{r}{R_p})$ where C is a dimensionless constant, and R_P is the radius of the planet. The gravitational field of the planet for $r < R_P$ is

A) $\bar{g} = -\rho_o G(\frac{r}{2} - \frac{Cr^2}{3R_p})\hat{r}$ $* 4\pi$

B) $\bar{g} = -\rho_o G(\frac{r}{3} - \frac{Cr^2}{4R_p})\hat{r}$ $* 4\pi$

C) $\bar{g} = -\rho_o G(r - \frac{Cr^2}{R_p})\hat{r}$ $* 4\pi$

D) $\bar{g} = -\rho_o GC\frac{r^2}{R_p}\hat{r}$ $* 4\pi$

E) $\bar{g} = -\rho_o G\frac{r}{3}\hat{r}$ $* 4\pi$

$$M_{enc} = \int_0^r \rho\, dr$$

$$= \int_0^r \rho_0 (1 - c\frac{r}{R_p})\, dr$$

$$= \rho_0 \int_0^r 1 - c\frac{r}{R_p}\, dr$$

$$= \rho_0 \left(r - c\frac{r^2}{2R_p}\right]_0^r$$

$$M_{enc} = \rho_0 \left(r - c\frac{r^2}{2R_p}\right)$$

$$g \cdot 4\pi r^2 = \frac{\rho_0 (r - c\frac{r^2}{2R_p}) \cdot -4\pi G}{r^2}$$

$$g = \rho_0 \left(\frac{1}{r} - c/2R_p\right)$$