37. Suitable units for the gravitational constant G are:
A) kg·m/s^2
B) m/s^2
C) N·s/m
D) kg·m/s
E) m^3/(kg·s^2)

$G \to N \frac{m^2}{kg^2} \to kg \cdot \frac{m}{s^2} \cdot \frac{m^2}{kg^2}$

$= \frac{m^3}{s^2 \cdot kg}$

38. When the brakes of an automobile are applied, the road exerts the greatest retarding force:
A) while the wheels are sliding
B) just before the wheels start to slide
C) when the automobile is going fastest
D) when the acceleration is least
E) at the instant when the speed begins to change

39. A sledge (including load) weighs 5000 N. It is pulled on level snow by a dog team exerting a horizontal force on it. The coefficient of kinetic friction between sledge and snow is 0.05. How much work is done by the dog team pulling the sledge 1000 m at constant speed?
A) 2.5×10^4 J
B) 2.5×10^5 J
C) 5.0×10^5 J
D) 2.5×10^6 J
E) 5.0×10^6 J

$W = F \cdot d$

$= F_g \cdot \mu_k \cdot d$

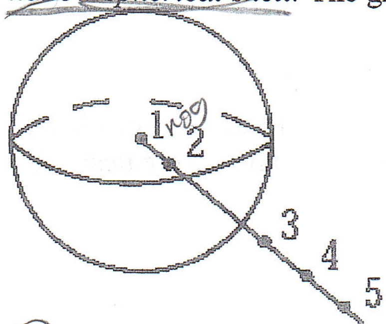
$= 2.5 \times 10^5$

40. Two carts (A and B), having spring bumpers, collide as shown. Cart A has a mass of 2 kg and is initially moving to the right. Cart B has a mass of 3 kg and is initially stationary. When the separation between the carts is a minimum:

A) cart B is still at rest
B) cart A has come to rest
C) the carts have the same momentum
D) the carts have the same kinetic energy
E) the kinetic energy of the system is at a minimum

Name: Qiu, ze Qin Date: ______

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) $\vec{g} = -\rho_o G(\frac{r}{2} - \frac{Cr^2}{3R_P})\hat{r}$ $\quad * 4\pi$

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

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

D) $\vec{g} = -\rho_o GC\frac{r^2}{R_P}\hat{r}$ $\quad * 4\pi$

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

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

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

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

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

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

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

$g = \rho_o \left(\frac{1}{r} - c/_{2R_P}\right)$