Homework Test Assignment

1. The position of the front bumper of a test car under the microprocessor control is given by $x(t) = 2.17\,\mathrm{m} + (4.80\,\mathrm{m/s^2})t^2 - (0.100\,\mathrm{m/s^6})t^6$. Find its position and acceleration at the instants when the car has zero velocity.

2. A force $\vec{F} = (3.00\,\mathrm{N})\hat{i} + (7.00\,\mathrm{N})\hat{j} + (7.00\,\mathrm{N})\hat{k}$ acts on a 2.00 kg mobile object that moves from an initial position of $\vec{r}_i = (3.00\,\mathrm{m})\hat{i} - (2.00\,\mathrm{m})\hat{j} + (5.00\,\mathrm{m})\hat{k}$ to a final position of $\vec{r}_f = -(5.00\,\mathrm{m})\hat{i} + (4.00\,\mathrm{m})\hat{j} + (7.00\,\mathrm{m})\hat{k}$ in 4.00 s. Find (a) the work done on the object by the force in the 4.00 s interval, (b) the average power due to the force during that interval, and (c) the angle between vectors $\vec{r}_i$ and $\vec{r}_f$.

3. Figure 1 shows two concentric rings, of radii R and $R' = 3.00R$, that lie on the same plane. Point P lies on the central z axis, at distance $D = 2.00R$ from the center of the rings. The smaller ring has uniformly distributed charge $+Q$. In terms of Q, what is the uniformly distributed charge on the larger ring if the net electric field at P is zero?

4. For the circuit shown in Figure 2 find the reading of the idealized ammeter (i.e. the current) if the battery has an internal resistance of $3.26\,\Omega$.

5. A particle with a charge of $-1.24 \times 10^{-8}\,C$) is moving with instantaneous velocity $\vec{v} = (4.19 \times 10^4\,\mathrm{m/s})\hat{i} + (-3.85 \times 10^4\,\mathrm{m/s})\hat{j}$. What is the force exerted on this particle by a magnetic field $\vec{B} = (1.40\,\mathrm{T})\hat{k}$?
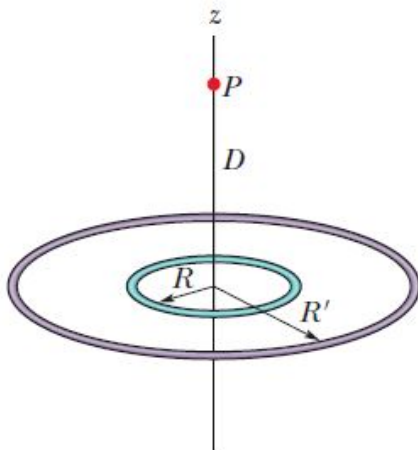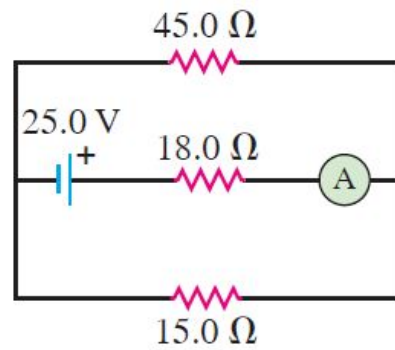

Figure 1

Figure 2