PHY 212 General Physics II - Electricity, Magnetism and Light
Summer 2007

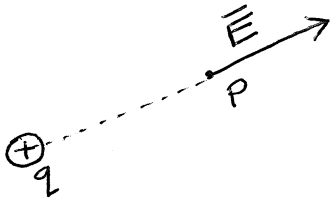
Quiz 1 Tuesday, July 03

Name:

1. (6 points) For the two vectors $\mathbf{A} = 3i + 2j$ and $\mathbf{B} = 4i + 5k$, find (i) the scalar product $\mathbf{A} \cdot \mathbf{B}$ and (ii) the vector product $\mathbf{A} \times \mathbf{B}$

$$\bar{A}\cdot\bar{B} = A_x B_x + A_y B_y + A_z B_z$$
$$= 12 + 0 + 0 = 12$$
$$\bar{A}\times\bar{B} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 3 & 2 & 0 \\ 4 & 0 & 5 \end{vmatrix} = \hat{\imath}(10-0) - \hat{\jmath}(15-0) + \hat{k}(0-8)$$
$$= 10\hat{\imath} - 15\hat{\jmath} - 8\hat{k}$$

2. (6 points) A point charge q produces an electric field $\mathbf{E}$ at *all* points in space. (i)Indicate the vector $\mathbf{E}$ at point P which is at a distance r away from q. (ii) Write an expression for electric field at P.



$$\bar{E} = \frac{1}{4\pi\epsilon_0}\frac{q}{r^2}\hat{r}$$

3. (3 points) Two point charges, one milli Coulomb ($10^{-3}C$) and one micro Coulomb ($10^{-6}C$) are 3 meters apart. Find the magnitude of the force between them using Coulomb's law.

$$F = \frac{1}{4\pi\epsilon_0}\frac{|q_1 q_2|}{r^2}$$
$$= 9\times10^{9}\left(\frac{N m^2}{C^2}\right)\times\frac{10^{-3}C\times10^{-6}C}{(3)^2 m^2} = 9\times10^{9}\times\frac{10^{-9}}{9} = 1\ N$$