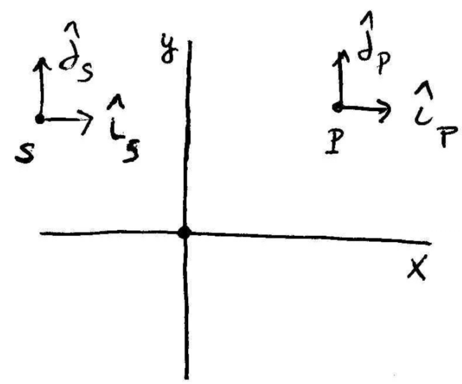
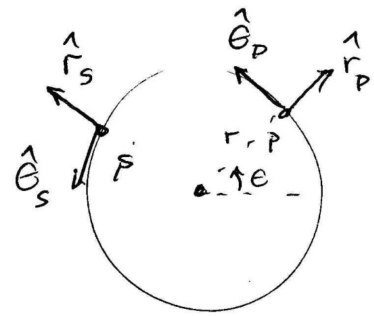
Vectors
Concept Questions

Question 1. Consider the pair of units vectors $(\hat{\mathbf{i}}_P, \hat{\mathbf{j}}_P)$ located at the point P, and the pair of units vectors $(\hat{\mathbf{i}}_S, \hat{\mathbf{j}}_S)$ located at the point S. Which of the following statements is true?



1) $\hat{\mathbf{i}}_P \neq \hat{\mathbf{i}}_S$
2) $\hat{\mathbf{j}}_P \neq \hat{\mathbf{j}}_S$
3) $\hat{\mathbf{i}}_P = \hat{\mathbf{i}}_S$
4) $\hat{\mathbf{j}}_P = \hat{\mathbf{j}}_S$

Question 2. Consider the pair of units vectors $(\hat{\mathbf{r}}_P, \hat{\boldsymbol{\theta}}_P)$ located at the point P, and the pair of units vectors $(\hat{\mathbf{r}}_S, \hat{\boldsymbol{\theta}}_S)$ located at the point S. Which of the following statements is true?



1) $\hat{\mathbf{r}}_P \neq \hat{\mathbf{r}}_S$
2) $\hat{\boldsymbol{\theta}}_P \neq \hat{\boldsymbol{\theta}}_S$
3) $\hat{\mathbf{r}}_P = \hat{\mathbf{r}}_S$
4) $\hat{\boldsymbol{\theta}}_P = \hat{\boldsymbol{\theta}}_S$

Question 3. Consider two vectors $\vec{\mathbf{A}} = 2\hat{\mathbf{i}} + 3\,\hat{\mathbf{k}}$ and $\vec{\mathbf{B}} = -6\hat{\mathbf{i}} + 4\,\hat{\mathbf{k}}$. The two vectors are

1. parallel.
2. perpendicular.
3. neither parallel or perpendicular.

Question 4 Consider a vector $\vec{\mathbf{A}}$ with $\left|\vec{\mathbf{A}}\right| > 1$. The unit vector pointing in the same direction as the vector $\vec{\mathbf{A}}$ is given by

1) $\dfrac{\left|\vec{\mathbf{A}}\right|}{\vec{\mathbf{A}}}$
2) $\dfrac{\vec{\mathbf{A}}}{\left|\vec{\mathbf{A}}\right|}$
3) $\left|\vec{\mathbf{A}}\right|\vec{\mathbf{A}}$
4) $\dfrac{1}{\left|\vec{\mathbf{A}}\right|\vec{\mathbf{A}}}$

Question 5 Consider two vectors $\vec{\mathbf{A}} = A_x \hat{\mathbf{i}}$, $\vec{\mathbf{B}} = B_x \hat{\mathbf{i}} + B_z \hat{\mathbf{k}}$ with $A_x < 0$, $B_x < 0$, and $B_z > 0$. The cross product $\vec{\mathbf{A}} \times \vec{\mathbf{B}}$ points in the

1) + x-direction
2) -x-direction
3) +y-direction
4) -y-direction
5) +z-direction
6) -z-direction
7) None of the above directions