

## Problem 1.8

*Vector proof of a trigonometric identity*

Let  $\hat{\mathbf{a}}$  and  $\hat{\mathbf{b}}$  be unit vectors in the  $x$ - $y$  plane making angles  $\theta$  and  $\phi$  with the  $x$  axis, respectively. Show that  $\hat{\mathbf{a}} = \cos \theta \hat{\mathbf{i}} + \sin \theta \hat{\mathbf{j}}$ ,  $\hat{\mathbf{b}} = \cos \phi \hat{\mathbf{i}} + \sin \phi \hat{\mathbf{j}}$ , and using vector algebra prove that

$$\cos(\theta - \phi) = \cos \theta \cos \phi + \sin \theta \sin \phi.$$