1. Given the vectors $\mathbf{a} =< 1, -3 >$ and $\mathbf{b} =< -3, 4 >$. Find
   (a) The scalar and vector projections of **a** onto **b**
   (b) The scalar and vector projections of **b** onto **a**
2. Find the distance from the point (1,3) to the line $2x - 3y - 5 = 0$.
3. Find the distance between the parallel lines $y = 2x + 3$ and $y - 2x = 9$.
4. Find a Cartesian equation for the following parametric curves. Sketch the curve.
   (a) $x = 1 - t^2$, $y = 1 - t$, $-1 \le t \le 1$
   (b) $x = 1 + \sin t$, $y = 2 + \cos t$
   (c) $x = \tan t$, $y = \cot^2 t$, $\dfrac{\pi}{6} \le t \le \dfrac{\pi}{3}$
5. An object is moving in the xy-plane and its position after t seconds is $\mathbf{r}(t) =< t^2 + t, t - 4 >$.
   (a) At what time is the object at the point (12,-1).
   (b) Does the object pass through the point (4,8)?
   (c) Find an equation in x and y whose graph is the path of the object.
6. Find a vector equation of the line containing the points (1,2) and (3,-4).
7. Find parametric equations of the line passing through the point (-1,1) and parallel to the vector $\vec{\imath} - 5\vec{\jmath}$.
8. Determine whether the lines $\mathbf{r}(t) = (-4 + 2t)\vec{\imath} + (5 + t)\vec{\jmath}$ and $\mathbf{r}(t) = (2 + 3t)\vec{\imath} + (4 - 6t)\vec{\jmath}$ are parallel, perpendicular or neither. If they are not parallel, find their point of intersection.
9. Find the exact value of the expression.
   a) $\sin^{-1}\left(\dfrac{\sqrt{3}}{2}\right)$
   b) $\sin^{-1}\left(-\dfrac{\sqrt{3}}{2}\right)$
   c) $\cos^{-1}\left(\dfrac{1}{2}\right)$
   d) $\cos^{-1}\left(-\dfrac{1}{2}\right)$
   e) $\tan^{-1}\left(\dfrac{1}{\sqrt{3}}\right)$
   f) $\tan^{-1}\left(-\dfrac{1}{\sqrt{3}}\right)$
   g) $\sin\left(\arccos\dfrac{1}{4}\right)$
   h) $\cos\left(\arctan\dfrac{6}{5}\right)$
10. Simplify the expression
    (a) $\tan\left(\cos^{-1} x\right)$
    (b) $\sin\left(\tan^{-1} x\right)$