1. Find $\mathbf{a} \cdot \mathbf{b}$

   (a) $|\mathbf{a}| = 2$, $|\mathbf{b}| = 5$ and the angle between $\mathbf{a}$ and $\mathbf{b}$ is $150°$

   (b) $\mathbf{a} = -3\vec{\imath} + \vec{\jmath}$, $\mathbf{b} = 2\vec{\imath} + 4\vec{\jmath}$

2. Given the vectors $\mathbf{a} =< 1, -3 >$ and $\mathbf{b} =< -3, 4 >$. Find

   (a) The scalar and vector projections of $\mathbf{a}$ onto $\mathbf{b}$

   (b) The scalar and vector projections of $\mathbf{b}$ onto $\mathbf{a}$

3. A boat sails south with the help of a wind blowing in the direction S36°E with magnitude 400 lb. Find the work done by the wind as the boat moves 110 ft. (Round your answer to the nearest whole number.)

4. Find, correct to the nearest degree, the angle B of the triangle with the vertices $A(1, 0)$, $B(4, 5)$, $C(-1, 2)$

5. Find a unit vector orthogonal to the vector $< -2, 4 >$.

6. Find the value(s) of x such that the vectors $x\vec{\imath} + 3x\vec{\jmath}$ and $x\vec{\imath} - 4\vec{\jmath}$ are orthogonal.

7. Find the distance from the point (1,3) to the line $2x - 3y - 5 = 0$.

8. Find the distance between the parallel lines $y = 2x + 3$ and $y - 2x = 9$.

9. Find a Cartesian equation for the following parametric cu rves. 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) $x = \tan t$, $y = \cot^2 t$, $\dfrac{\pi}{6} \le t \le \dfrac{\pi}{3}$

10. 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.

11. Find a vector equation of the line containing the points (1,2) and (3,-4).

12. Find parametric equations of the line passing through the point (-1,1) and parallel to the vector $\vec{\imath} - 5\vec{\jmath}$.

13. 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.

14. Find all holes and vertical asymptote(s) for the graph of

$$g(x) = \frac{(x^2 + 5x)(x - 2)}{(x + 1)(x^2 + 4x - 5)}$$

    and determine the behavior of the function near the vertical asymptotes.

15. For the function g whose graph is given, state the value of the given quantity, if it exists.

(a) $\lim_{x \to -2^-} g(x)$

(b) $\lim_{x \to -2^+} g(x)$

(c) $\lim_{x \to -2} g(x)$

(d) $g(-2)$

(e) $\lim_{x \to 0} g(x)$

(f) $g(0)$

(g) $\lim_{x \to 2^-} g(x)$

(h) $\lim_{x \to 2^+} g(x)$

(i) $g(2)$

(j) $\lim_{x \to 4^-} g(x)$

(k) $\lim_{x \to 4^+} g(x)$

(l) $\lim_{x \to 4} g(x)$