1. Find the exact value of $\sin\left(\frac{17\pi}{12}\right)$.

2. If $\csc\theta = -\frac{4}{3}$ and $\frac{3\pi}{2} \leq \theta \leq 2\pi$, find $\cos\theta$, $\sin\theta$, $\tan\theta$, $\cot\theta$.

3. A constant force $\mathbf{F} = 5\vec{\imath} + 6\vec{\jmath}$ moves an object along a straight line from the point (-1,2) to the point (2,3). Find the work done by the force $\mathbf{F}$.

4. Suppose that a wind is blowing in the direction S45°E at a speed of 60 km/h. A pilot is steering a plane in the direction N60°E at an airspeed (speed in still air) of 100 km/h. Find the ground speed of the plane.

5. Find the scalar and vector projections of the vector $2\vec{\imath} - 3\vec{\jmath}$ onto the vector $\vec{\imath} + 6\vec{\jmath}$.

6. Find the vector, parametric, and the Cartesian equations for the line passing through the points $A(1, -3)$ and $B(2, 1)$.

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

8. Given the parametric curve $x(t) = 1 + \cos t$, $y(t) = 1 - \sin^2 t$.

   (a) Find a Cartesian equation for this curve.

   (b) Does the parametric curve go through the point (1,0)? If yes, give the value(s) of t.

   (c) Sketch the graph of the parametric curve on the interval $0 \leq t \leq \pi$, include the direction of the path.

9. Evaluate the limit (do no use the L'Hospital's Rule):

(a) $\lim_{x\to 5} \dfrac{x^2-5x+10}{x^2-25}$

(b) $\lim_{x\to 7} \dfrac{2-\sqrt{x-3}}{x^2-49}$

(c) $\lim_{t\to 1} \left\langle \dfrac{t^2-2t+1}{t-1}, \dfrac{\sqrt{t}-1}{t^2-1} \right\rangle$

(d) $\lim_{x\to -2} \dfrac{x^2-4}{|x+2|}$

(e) $\lim_{x\to 0}\left(\dfrac{1}{x\sqrt{x+1}}-\dfrac{1}{x}\right)$

(f) $\lim_{y\to\infty}\dfrac{7y^3+4y}{2y^3-y^2+3}$

(g) $\lim_{x\to-\infty}\left(x+\sqrt{x^2+2x}\right)$

10. (a) Find and classify all points of discontinuity for the function

$$f(x)=\begin{cases} x^2+1 & , \text{ if } x<2,\\ x+2 & , \text{ if } x\geq 2.\end{cases}$$

(b) Find the vertical and horizontal asymptotes of the curve $y = \dfrac{x^2+4}{3x^2-3}$.

11. Use the Intermediate Value Theorem to show that there is a root of the equation $x^3 - 3x + 1 = 0$ in the interval (1,2).

12. Find $f'(x)$ by using the definition of derivative if

(a) $f(x) = (3-x)^2$

(b) $f(x) = \sqrt{x-2}$

(c) $f(x) = \dfrac{1}{x+1}$

13. Let $f(x) = x|x|$

    (a) For what values of x is f differentiable?

    (b) Find a formula for f'.

14. At what point on the curve $y = x^{3/2}$ is the tangent line parallel to the line $3x - y + 6 = 0$.

15. Find the tangent vector and parametric equations for the line tangent to the curve $\vec{r}(t) = < t^2 + 2t, t^3 - t >$ at the point corresponding to $t = 1$.

16. The displacement of an object moving in a straight line is given by $s(t) = 1 + 2t + t^2/4$ (t is in seconds). Find the velocity of the object when $t = 1$.

17. The vector function $\vec{r}(t) = (t^2 - 4t)\vec{\imath} + (2t + 1)\vec{\jmath}$ represents the position of a particle at time t.

(a) Find the velocity of the particle when $t = 1$

(b) Find the speed of the particle when $t = 1$