

- Find the exact value of $\sin\left(\frac{17\pi}{12}\right)$.
- If $\csc\theta = -\frac{4}{3}$ and $\frac{3\pi}{2} \leq \theta \leq 2\pi$, find $\cos\theta$, $\sin\theta$, $\tan\theta$, $\cot\theta$.
- A constant force $\mathbf{F} = 5\vec{i} + 6\vec{j}$ 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} .
- 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.
- Find the scalar and vector projections of the vector $2\vec{i} - 3\vec{j}$ onto the vector $\vec{i} + 6\vec{j}$.
- Find the vector, parametric, and the Cartesian equations for the line passing through the points $A(1, -3)$ and $B(2, 1)$.
- Find the distance between the parallel lines $y = 2x + 3$ and $y - 2x = 9$.
- Given the parametric curve $x(t) = 1 + \cos t$, $y(t) = 1 - \sin^2 t$.
 - Find a Cartesian equation for this curve.
 - Does the parametric curve go through the point $(1,0)$? If yes, give the value(s) of t .
 - Sketch the graph of the parametric curve on the interval $0 \leq t \leq \pi$, include the direction of the path.
- Evaluate the limit (do not use the L'Hospital's Rule):

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

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

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

(d) $\lim_{x \rightarrow -2} \frac{x^2 - 4}{|x + 2|}$

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

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

(g) $\lim_{x \rightarrow -\infty} (x + \sqrt{x^2 + 2x})$

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 $y = \frac{x^2 + 4}{3x^2 - 3}$.

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) $f(x) = \frac{1}{x + 1}$

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 $\vec{r}(t) = \langle t^2 + 2t, t^3 - t \rangle$ 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 $\vec{r}(t) = (t^2 - 4t)\vec{i} + (2t + 1)\vec{j}$ 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 $t = 1$