

1. Find the exact value of the expression.

(a) $\arcsin \frac{\sqrt{3}}{2}$

(b) $\arccos \left(-\frac{1}{2}\right)$

(c) $\sin^{-1} \left(-\frac{\sqrt{2}}{2}\right)$

(d) $\tan^{-1} \sqrt{3}$

(e) $\sin \left(\cos^{-1} \left(-\frac{3}{5}\right)\right)$

(f) $\sin(\arcsin 3)$

(g) $\cos^{-1} \left(\cos \frac{4\pi}{3}\right)$

(h) $\tan^{-1} \left(\tan \frac{5\pi}{4}\right)$

(i) $\sin^{-1} \left(\sin \frac{11\pi}{6}\right)$

(j) $\sin \left(2 \cos^{-1} \frac{1}{3}\right)$

2. Simplify each expression.

(a) $\tan(\sin^{-1} x)$

(b) $\cos(\tan^{-1} x)$

3. Find the limit.

(a) $\lim_{x \rightarrow \infty} \sin^{-1} \left(\frac{x^2 - 1}{2x^2 + 4} \right)$

(b) $\lim_{x \rightarrow \infty} \tan^{-1} \left(\frac{x^2}{2 - x} \right)$

4. Find the domain of the function $f(x) = \arccos(3x + 2)$.

5. Find the derivative.

(a) $y = \tan^{-1}(2x + 1)$

(b) $y = \sqrt{x} \sin^{-1}(x^3)$

(c) $y = (\cos^{-1}(4 - 2x))^5$

6. Find the limit.

(a) $\lim_{x \rightarrow \infty} \frac{(\ln x)^2}{x - 1}$

(b) $\lim_{x \rightarrow 0} \frac{\sin x - x}{x^3}$

(c) $\lim_{x \rightarrow 0^+} x^2 \ln x$

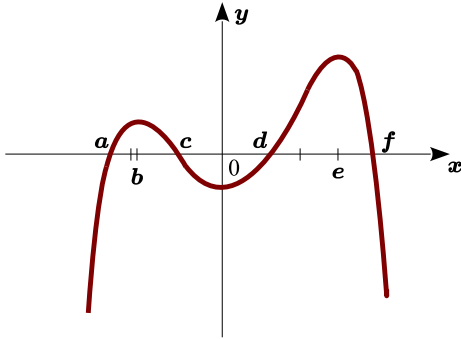
(d) $\lim_{x \rightarrow \infty} (e^x + x)^{1/x}$

(e) $\lim_{x \rightarrow 0} (\sin x)^{\tan x}$

(f) $\lim_{x \rightarrow 1} \left(\frac{1}{\ln x} - \frac{1}{x-1} \right)$

7. The graph of the derivative, $f'(x)$, is shown below. Use the graph to answer these questions.

- (a) On what intervals is f increasing? decreasing?
- (b) On what intervals is f concave up? concave down?
- (c) At what values of x does f have a local maximum or minimum?
- (d) At what values of x does f have an inflection point?
- (e) Assuming that f is continuous and $f(0) = 0$, sketch a graph of f .



8. Find all absolute and local extrema for the following functions by graphing.

(a) $f(x) = x^2 - 3, -1 \leq x \leq 2$.

(b) $f(x) = \begin{cases} x^2, & \text{if } -1 \leq x < 0 \\ 2 - x^2, & \text{if } 0 \leq x \leq 1 \end{cases}$

9. Find all critical numbers for the following functions.

(a) $f(x) = \sqrt[3]{x}(x-1)^2$

(b) $f(x) = |x^2 - 5x|$

(c) $f(x) = xe^{-2x}$

10. Find the absolute maximum and absolute minimum of the given function on the given interval.

(a) $f(x) = x^3 - 12x + 1, [-3, 5]$

(b) $f(x) = \frac{\ln x}{x}, [1, 3]$

(c) $f(t) = 16 \cos t + 8 \sin 2t, \left[0, \frac{\pi}{2}\right]$