

1. Compute the following limits.

(a) $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\cos x}{x - \frac{\pi}{2}}$

(b) $\lim_{x \rightarrow \infty} \frac{(\ln x)^2}{x}$

(c) $\lim_{x \rightarrow 0} \frac{\cos x}{x}$

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

(e) $\lim_{x \rightarrow 0} \frac{x - \arctan x}{x^3}$

(f) $\lim_{x \rightarrow 0} \frac{\sin(2x) - 2x}{x^3}$

(g) $\lim_{x \rightarrow 1} \frac{\cos\left(\frac{\pi x}{2}\right)}{\ln x}$

2. Consider the function $f(x) = x\sqrt{2 - x^2}$. Find the domain, intercepts, asymptotes, intervals of increase/decrease, local max/mins, and concavity, and then graph $y = f(x)$. (Do not use a graphing calculator.)