

L'Hôpital's Rule - Practice Questions

1. Using l'Hôpital's rule (or otherwise) calculate the following limits.

(a) $\lim_{x \rightarrow \infty} \frac{\ln x}{\sqrt{x}}$

(b) $\lim_{x \rightarrow \infty} x^3 e^{-x}$

(c) $\lim_{x \rightarrow 1} \sqrt{1-x} \ln x$

(d) $\lim_{x \rightarrow -\infty} x e^x$

(e) $\lim_{x \rightarrow \infty} e^{-x} \ln x$

(f) $\lim_{x \rightarrow \infty} x^{1/x}$

(g) $\lim_{x \rightarrow \infty} x^{e^x}$

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

(i) $\lim_{x \rightarrow \infty} (x - \sqrt{x^2 - 1})$

(j) $\lim_{x \rightarrow \infty} (x e^{1/x} - x)$

2. Carefully graph the following functions on their respective domains, be sure to indicate all points of interest on the graph.

(a) $f(x) = x^2 e^{-x}$

(b) $g(x) = x e^{-x^2}$

(c) $F(x) = x^2 \ln x$

(d) $G(x) = x(\ln x)^2$

Answers to Question 1: (a) - (e) and (i) is 0, (f) and (j) is 1, (g) is ∞ , and (h) is DNE.