

Exercise Set: Limits
Assigned Tuesday, Oct 23d

1. Find the limit, if it exists. For these problems, try not to use l'Hospital's rule (for practice):

(a) $\lim_{x \rightarrow 1} e^{x^2 - x}$	(d) $\lim_{x \rightarrow 10^-} \ln(100 - x^2)$
(b) $\lim_{x \rightarrow -3} \frac{x^2 - 9}{x^2 + 2x - 3}$	(e) $\lim_{x \rightarrow 0} x^2 \cos(2/x)$
(c) $\lim_{x \rightarrow 0} \frac{1 - \sqrt{1 - x^2}}{x}$	(f) $\lim_{x \rightarrow 0^+} \sqrt{x} e^{\sin(\pi/x)}$

2. Find the limit, using l'Hospital's rule where appropriate.

(a) $\lim_{t \rightarrow 0} \frac{e^t - 1}{t^3}$	(g) $\lim_{x \rightarrow 0} \frac{x}{\tan^{-1}(4x)}$
(b) $\lim_{x \rightarrow 0} \frac{x + \tan(x)}{\sin(x)}$	(h) $\lim_{x \rightarrow 0^+} \sqrt{x} \ln(x)$
(c) $\lim_{x \rightarrow 0} \frac{5^x - 3^x}{x}$	(i) $\lim_{x \rightarrow 1^+} \ln(x) \tan(\pi x/2)$
(d) $\lim_{x \rightarrow -2} \frac{x + 2}{x^2 + 3x + 2}$	(j) $\lim_{x \rightarrow \infty} x^3 e^{-x}$
(e) $\lim_{x \rightarrow (\pi/2)^+} \frac{\cos(x)}{1 - \sin(x)}$	(k) $\lim_{x \rightarrow \infty} (e^x + x)^{1/x}$
(f) $\lim_{x \rightarrow 0^+} (\tan(2x))^x$	(l) $\lim_{x \rightarrow \infty} \left(\frac{x}{x+1} \right)^x$

3. Exercises 1-5, Section 4.8

4. Does each of following have vertical asymptote(s)? If so, find them.

(a) $y = \frac{x^2}{x^2 - 1}$	(c) $y = \frac{e^x}{1 + e^x}$
(b) $y = \frac{x^2 - 9}{x^2 + 2x - 3}$	(d) $y = \ln(1 - \ln(x))$

5. Does each of following have horizontal asymptote(s)? If so, find them.

(a) $y = \frac{x^2}{x^2 - 1}$	(c) $y = \frac{3e^x}{1 + 2e^x}$
(b) $y = \frac{\sqrt{x^2 + 5x + 1}}{3x - 1}$	(d) $y = \sqrt{x^2 + 1} - x$