

MAT 137
Tutorial #4– Limit computations
October 15-16, 2017

Note: L'Hôpital's Rule is neither required, nor recommended, for any of these limits.

1. Calculate the following limits:

(a) $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3}$

(b) $\lim_{x \rightarrow 1} (x^2 + 2^x)$

(c) $\lim_{h \rightarrow 2} \frac{h^3 - 5h^2 + 3h + 6}{h^3 - h^2 - 3h + 2}$

(d) $\lim_{x \rightarrow 3} \frac{2 - x}{x - 3}$

(e) $\lim_{x \rightarrow 3} \frac{2 - x}{(x - 3)^2}$

(f) $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - 1}{x}$

(g) $\lim_{x \rightarrow \infty} \frac{x^3 + 2x + 1}{4x^3 - x^2 + 6}$

(h) $\lim_{x \rightarrow \infty} \frac{\sqrt{x^2 + 1} + 2x}{5x}$

(i) $\lim_{x \rightarrow \infty} \frac{\sin x}{x}$

(j) $\lim_{t \rightarrow 0} \frac{t}{\sin(2t)}$

(k) $\lim_{x \rightarrow 0} \frac{\sin(2x)}{\sin(3x)}$

(l) $\lim_{z \rightarrow 0} \frac{\sin(2z^2)}{\cos(3z) \sin^2(5z)}$

(m) $\lim_{x \rightarrow 3} \frac{\tan(x - 3)}{2x - 6}$

(n) $\lim_{x \rightarrow 0} \frac{2e^x}{\sin(2e^x)}$

(o) $\lim_{t \rightarrow 0} \frac{1 - \cos(3t)}{t^2}$

(p) $\lim_{y \rightarrow 1} \frac{\sqrt{y+4} - \sqrt{4y+1}}{\sqrt{y} - 1}$

2. Calculate the following limits:

Note: These questions are harder. Do not attempt them before solving Question 1

(a) $\lim_{x \rightarrow 0} \frac{\sin(1 - \cos x)}{x \tan(\pi x)}$

(b) $\lim_{u \rightarrow 2} \frac{1}{2 - u} \left(\sqrt{\frac{u+2}{u-1}} - 2 \right)$

(c) $\lim_{x \rightarrow \infty} \left[x + \sqrt{x^2 - x} \right]$

(d) $\lim_{x \rightarrow -\infty} \left[x + \sqrt{x^2 - x} \right]$

Hint: The answers to Questions 2c and 2d are different.