

## IN-CLASS ACTIVITY : LIMITS OF QUOTIENTS

1. Compute the following limits :

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| i) $\lim_{x \rightarrow 4} \frac{x^2-16}{x-4}$                 | viii) $\lim_{x \rightarrow 3} \left( \frac{1}{x-3} - \frac{4}{x^2-2x-3} \right)$ |
| ii) $\lim_{x \rightarrow 2} \frac{x-2}{x^2-2x}$                | ix) $\lim_{x \rightarrow 5} \frac{\sqrt{x-1}-2}{x-5}$                            |
| iii) $\lim_{x \rightarrow 6} \frac{3x-18}{2x-12}$              | x) $\lim_{x \rightarrow -3} \frac{\sqrt{x+4}-1}{x+3}$                            |
| iv) $\lim_{x \rightarrow 9} \frac{x-9}{\sqrt{x}-3}$            | xi) $\lim_{x \rightarrow -2^-} \frac{2x^2+7x-4}{x^2+x-2}$                        |
| v) $\lim_{x \rightarrow \pi} \frac{\sin(x)}{\tan(x)}$          | xii) $\lim_{x \rightarrow -2^+} \frac{2x^2+7x-4}{x^2+x-2}$                       |
| vi) $\lim_{x \rightarrow 1} \frac{x^3-1}{x^2-1}$               | xiii) $\lim_{x \rightarrow 1^-} \frac{2x^2+7x-4}{x^2+x-2}$                       |
| vii) $\lim_{x \rightarrow \frac{1}{2}} \frac{2x^2+3x-2}{2x-1}$ | xiv) $\lim_{x \rightarrow 1^+} \frac{2x^2+7x-4}{x^2+x-2}$                        |

2. The density of an object is given by its mass divided by its volume  $\rho = \frac{m}{V}$ .

- Write the volume as a function  $V(\rho)$  of the density.
- Assuming  $m = 8\text{kg}$ , plot the volume  $V(\rho)$  for  $0 < \rho < 80$ .
- Evaluate  $\lim_{\rho \rightarrow 0^+} V(\rho)$  and explain its physical meaning.

3. Sketch the graph of a function  $f(x)$  with the following properties :

- $f$  is defined for all real numbers ;
- $f(-6) = 3$  ;
- $\lim_{x \rightarrow -3^-} f(x) = \lim_{x \rightarrow -3^+} f(x) = 2$  ;
- $f(-3) = 3$  ;
- $\lim_{x \rightarrow 3^-} f(x) = f(3)$  ;
- $f$  is not continuous at  $x = 3$  ;
- $\lim_{x \rightarrow 0} f(x) = +\infty$ .

4. Decide whether the following statements are true or false :

- The function  $f(x) = \frac{2}{e^x - e^{-x}}$  is continuous everywhere.
- If  $\lim_{x \rightarrow 0^+} f(x) = \lim_{x \rightarrow 0^-} f(x)$ , then  $f$  is continuous at  $x = 0$ .
- The function  $f(x) = \frac{x^2-4x+3}{x^2-1}$  is continuous for  $2 \leq x < +\infty$ .
- If a function is not continuous at a point, then it is not defined at that point.