
IN-CLASS ACTIVITY : LIMITS AT INFINITY

1. Compute the limit of the following functions as $x \rightarrow \pm\infty$.

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| i) $f(x) = \frac{1}{3x+6}$ | vii) $f(x) = \frac{\sqrt{4x^2-1}}{x+2}$ |
| ii) $f(x) = \frac{2x-5}{4x}$ | viii) $f(x) = \frac{2\sqrt{x}}{x-\sqrt{x+1}}$ |
| iii) $f(x) = \frac{x^2-2x+5}{x+2}$ | ix) $\lim_{x \rightarrow 0} x \cos\left(\frac{1}{x}\right)$ |
| iv) $f(x) = \frac{3x^3-2x}{x^2+2x+8}$ | x) $\lim_{x \rightarrow +\infty} x e^{\frac{1}{x}}$ |
| v) $f(x) = \frac{x^4-4x^3+1}{2-2x^2-7x^4}$ | xi) $\lim_{x \rightarrow +\infty} x^2 e^{-x}$ |
| vi) $f(x) = \frac{3x}{\sqrt{x^2-1}}$ | xii) $\lim_{x \rightarrow +\infty} x \sin\left(\frac{1}{x}\right)$ |

2. Consider the function $f(x) = \frac{x^2+x-2}{x^2-3x-4}$.

- Indicate the points x_0 and x_1 where $f(x)$ is not continuous.
- Compute $\lim_{x \rightarrow x_0^\pm} f(x)$ and $\lim_{x \rightarrow x_1^\pm} f(x)$.
- Find the critical points of $f(x)$ and classify them
- Find the inflection points of $f(x)$
- Compute $\lim_{x \rightarrow \pm\infty} f(x)$.
- Sketch the graph of $f(x)$.

3. Consider the function $f(x) = x \ln(x)$.

- Indicate the interval in which the function is continuous and differentiable
- Find and classify the critical points of $f(x)$.
- Find the inflection points of $f(x)$, if any.
- Compute $\lim_{x \rightarrow +\infty} f(x)$.
- Compute $\lim_{x \rightarrow 0^+} f(x)$.
- Sketch the graph of $f(x)$.