MATH 2055 Tutorial 3 (Oct 5)

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Definitions:

$\lim\limits_{x\to\infty} f(x) = L$ if and only if $\forall \epsilon > 0$, $\exists N$, such that $\forall x > N$, we have $|f(x) - L| < \epsilon$

$\lim\limits_{x\to\infty} f(x) = +\infty \, (-\infty)$ if and only if $\forall M$, $\exists N$, such that $\forall x > N$, we have $f(x) > (<) M$

Find the following limits and prove it by definition.

1. $\lim\limits_{x\to\infty} \dfrac{1}{x}$

2. $\lim\limits_{x\to\infty} \dfrac{1}{x^2 + 1}$

3. $\lim\limits_{x\to\infty} \dfrac{x^2}{x + 1}$

4. $\lim\limits_{x\to\infty} \left(\dfrac{1}{\frac{1}{x} + 1} \right)^2$

5. $\lim\limits_{x\to\infty} \left(\sqrt{x + 1} - \sqrt{x} \right)$