

Practicing exercises – 2.

1. Find $N(\varepsilon)$ for the given sequences if $\varepsilon=0,001$: $a_n = \frac{n^2}{n^2 + 2}$; $b_n = \frac{1-3n}{n+1}$

2. Find the following limits: ; $\lim_{n \rightarrow \infty} \frac{3^n}{2^n + 4^n}$; $\lim_{n \rightarrow \infty} \frac{n^3}{n!}$; $\lim_{n \rightarrow \infty} \left(\frac{2n+5}{2n-1} \right)^{5n}$

3. $\lim_{x \rightarrow -\infty} (x + \sqrt{x^2 - 2x}) = ?$

$$\lim_{x \rightarrow 0} \frac{2x^2}{1 - \cos x} = ?$$

4. Find the points of discontinuity for the following functions, and classify them:

$$f(x) = \begin{cases} \frac{x}{(x-5)^2} & \text{if } x < 5 \\ 4x & \text{if } x \geq 5 \end{cases} ; g(x) = \begin{cases} 3x-2 & \text{if } x \leq 2 \\ \frac{x^2-4}{x-2} & \text{if } x > 2 \end{cases}$$

5. Find the derivative of the following functions

a.) by definition: $f(x) = \frac{1}{\sqrt{x}}$ b.) by rules: $f(x) = (x^2 + 1) \cdot \ln(2x)$; $f(x) = \sqrt{\cos(5x) + 3x}$

6. Give the equation of the tangent line to $f(x) = \sqrt{3x^2 - 2x}$ at the point $x_0=1$!

7. Find the following limits by L'Hospital rule: $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x^2 - 5x + 6}$; $\lim_{x \rightarrow 0^+} x \cdot \ln x$

8. Sketch the graph of $f(x) = \frac{e^x}{x}$

9. a.) Find x if $\begin{vmatrix} 2 & 0 & 1 \\ 0 & x & 1 \\ 3 & 0 & 8 \end{vmatrix} = 12$ b.) Evaluate $\underline{a} \cdot \underline{b}$, $\cos \phi$, and $\underline{a} \times \underline{b}$ if $\begin{cases} \underline{a} = 2\underline{i} + 5\underline{j} + 7\underline{k} \\ \underline{b} = \underline{i} + 5\underline{k} \end{cases}$