LIMITS
COURSE

LESSON 5

Basic limits of functions.

Review of sequence-limit techniques.

HOMEWORK

Part 1: TEST

Select the correct answer (only one is true).

Question 1

$$\lim_{x\to 1}\frac{x+1}{x+2}$$

What is the value of this limit?

a) $\frac{1}{2}$
b) 1
c) $\frac{2}{3}$
d) To determine it, one must factor out the highest powers from numerator and denominator.

Question 2

$$\lim_{x\to\infty}\frac{x^2+3x+1}{x^2+4}$$

The above limit is …

a) a (proper) limit of a function
b) a limit of a sequence
c) an improper limit of a function
d) an improper limit of a sequence

Question 3

$$\lim_{x\to-\infty}\left(\frac{4x-1}{2}\right)$$

What is the value of this limit?

a) ∞
b) 0
c) 2
d) $-\infty$

Question 4

$$\lim_{x\to\infty}\left(7+\ln x\right)$$

What is the value of this limit?

a) $-\infty$
b) ∞
c) 7
d) 0

Question 5

Arcsinx, arccosx, arctanx, arccotx are…

a) inverses of cyclometric functions
b) trigonometric functions
c) negatives of trigonometric functions
d) inverse trigonometric functions

Question 6

Indeterminate forms are:

a) $\left[\frac{0}{0}\right],\left[\frac{\infty}{\infty}\right],[0\cdot\infty],[\infty-\infty],\left[1^{\infty}\right],\left[0^{0}\right],\left[\infty^{0}\right]$
b) $\left[\frac{A}{\pm\infty}\right],\left[\frac{A}{0}\right],\left[\frac{0}{0}\right],\left[\frac{\infty}{\infty}\right],[0\cdot\infty],[\infty-\infty],\left[1^{\infty}\right]$
c) $\left[\frac{0}{0}\right],\left[\frac{\infty}{\infty}\right],[0\cdot\infty],[\infty-\infty],\left[1^{\infty}\right],\left[1^{0}\right],\left[\infty^{1}\right]$
d) $\left[\frac{0}{0}\right],\left[\frac{\infty}{\infty}\right],[0\cdot\infty],[\infty-\infty],\left[1^{\infty}\right],\left[0^{0}\right],\left[\infty^{\infty}\right]$

Question 7

$$\lim_{x\to 2}\frac{x+1}{x-4}$$

Will we compute the limit of this function by using the “factor-out-the-highest-power” method?

a) Yes
b) No

Question 8

$$\lim_{x \to 4} \frac{\sqrt{x} - 2}{2}$$

How should we compute the limit of this function?

a) Substitute x=4 and read the result directly
b) Multiply numerator and denominator by the conjugate of the numerator
c) Multiply numerator and denominator by the conjugate of the denominator
d) Factor out the highest powers

Question 9

$$\sqrt{x^2} = ?$$

What is the value of the square root of *x* squared?

a) $|x|$
b) x
c) ∞
d) $\infty \quad \text{or} \quad -\infty$

Question 10

With which indeterminate form is the “e-formula” associated?

a) $\left[\infty^0\right]$
b) $\left[\frac{0}{0}\right]$
c) $\left[1^\infty\right]$
d) $\left[\infty - \infty\right]$

Part 2: EXERCISES

Ex. 1

Solve the following limits:

1) $\lim_{x\to 3}\left(3x^2-2x+1\right)$
2) $\lim_{x\to -2}\frac{x^2+5x-1}{x^2+1}$
3) $\lim_{x\to 0}\frac{\sqrt{25+x}-5}{x}$
4) $\lim_{x\to \infty}\frac{7x-1}{7x+5}$
5) $\lim_{x\to \infty}\left(\sqrt{x^2+4x}-\sqrt{x^2-3x}\right)$
6) $\lim_{x\to -\infty}\frac{5x^4-x^3+1}{2x^2-5}$
7) $\lim_{x\to \infty}2x\left(\sqrt{x-1}-\sqrt{x+5}\right)$
8) $\lim_{x\to \infty}\left(1-\frac{1}{4x}\right)^x$
9) $\lim_{x\to \infty}\left(\frac{4x^2+1}{4x^2+5}\right)^{2x^2+7x}$

END