

# Matematická analýza 1 - cvičení 5

## Derivace

Phat Tran

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# 1 Main Section

## 1.1 Vypočti limitu

$$\lim_{x \rightarrow \frac{\pi}{4}} \frac{\sin x - \cos x}{\cos 2x}$$

$$\lim_{x \rightarrow \frac{\pi}{4}} \frac{\sin x - \cos x}{\cos 2x} \quad (1)$$

$$(\cos x + \sin x)(\cos x - \sin x) \lim_{x \rightarrow \frac{\pi}{4}} \frac{\sin x - \cos x}{\cos 2x} \quad (2)$$

$$\lim_{x \rightarrow \frac{\pi}{4}} \frac{-1}{\cos x + \sin x} \quad (3)$$

$$= \frac{1}{a\sqrt{x}} ??? \quad (4)$$

(5)

$$\forall \epsilon > 0, n \in \mathbb{N} |a - a_n| < \epsilon$$

$$\lim f(x) = a \iff (\forall \epsilon > 0)(\exists \delta > 0)(\forall x)$$

## 1.2

$$\lim_{x \rightarrow 1} (\ln x + x^3 + 2)$$

$$\lim_{x \rightarrow 1} \ln x + \lim_{x \rightarrow 1} x^3 + \lim_{x \rightarrow 1} 2 \quad (6)$$

$$= 0 + 1 + 2 = 3 \quad (7)$$

## 1.3

$$\lim_{x \rightarrow \frac{\pi}{4}} x \tan x$$

$$\lim_{x \rightarrow \frac{\pi}{4}} = \frac{\pi}{4} \quad (8)$$

(9)

**1.4**

$$\lim_{x \rightarrow \infty} \left( \frac{x^2 + x - 1}{2x^2 - x + 1} \right)^3$$

$$\lim_{x \rightarrow \infty} \left( \frac{x^2 + x - 1}{2x^2 - x + 1} \right)^3 \quad (10)$$

$$= \left( \frac{\infty}{\infty} \right)^3 \quad (11)$$

$$= \frac{x^2(1 + x^{-1} + x^{-2})}{x^2(2 - x^{-1} + x^{-2})} \quad (12)$$

$$= \left( \frac{1}{2} \right)^3 = \frac{1}{8} \quad (13)$$

**1.5**

$$\lim_{x \rightarrow -3} \frac{x^3 + 27}{x + 3}$$

$$\lim_{x \rightarrow -3} \frac{(x^3 + 27)'}{(x + 3)'} \quad (14)$$

$$= \frac{(x + 3)(x^2 - 3x + 9)}{x + 3} \quad (15)$$

$$= x^2 - 3x + 9 = 27 \quad (16)$$

**1.6**

$$\lim_{x \rightarrow \infty} \frac{\sqrt{x + \sqrt{x}} - 1}{\sqrt[3]{x} - \sqrt{3}}$$

$$\left(x^{\frac{1}{3}} - \sqrt{3}\right)'$$