

1. (a)

$$\lim_{x \rightarrow 1} \frac{\ln x}{1-x} = \lim_{x \rightarrow 1} \frac{1/x}{-1} = -1$$

(b)

$$\lim_{x \rightarrow 1^+} e^{\frac{\ln x}{1-x}} = e^{\lim_{x \rightarrow 1^+} \frac{\ln x}{1-x}} = e^{-1} = \frac{1}{e}$$

(c)

$$\lim_{x \rightarrow 0} \frac{2 \arcsin x}{3x} = \lim_{x \rightarrow 0} \frac{2 \frac{1}{\sqrt{1-x^2}}}{3} = \frac{2}{3}$$

(d)

$$\lim_{x \rightarrow \frac{\pi}{2}} \left(\frac{x}{\cot g x} - \frac{\pi}{2 \cos x} \right) = \lim_{x \rightarrow \frac{\pi}{2}} \left(\frac{1}{\frac{1}{\sin^2 x}} - \frac{0}{-2 \sin x} \right) = 1$$

2.

$$e^x(2+x)x$$

Kladná $\in (-\infty; -2) \cap (0; \infty)$

Záporná $\in (-2; 0)$

3.

$$\lim_{x \rightarrow \pi} \frac{x \cos 2x \sin 3x}{x^2 - \pi^2} = \lim_{x \rightarrow \pi} \frac{x \cos x \cos 2x + \sin x (\cos 2x - 2x \sin x)}{2x} = \frac{-\pi}{2\pi} = -\frac{1}{2}$$

Funkce je spojitá.