

微分積分Ⅱ春課題

平成 27 年 3 月 19 日

1

(1)

$$\begin{aligned} \lim_{x \rightarrow -1} \frac{x^2 + 3x + 2}{x^3 + x^2 + 3x + 3} \\ &= \lim_{x \rightarrow -1} \frac{(x+2)(x+1)}{(x+1)(x^2+3)} \\ &= \lim_{x \rightarrow -1} \frac{x+2}{x^2+3} \\ &= \frac{1}{4} \end{aligned}$$

(2)

$$\begin{aligned} \lim_{x \rightarrow \infty} \frac{2x^2 + 9x - 5}{3x^2 - x - 2} \\ &= \lim_{x \rightarrow \infty} \frac{2 + \frac{9}{x} - \frac{5}{x^2}}{3 - \frac{1}{x} - \frac{2}{x^2}} \\ &= \frac{2 + 0 - 0}{3 - 0 - 0} = \frac{2}{3} \end{aligned}$$

(3)

$$\begin{aligned} \lim_{x \rightarrow \infty} \frac{1 - 3^x}{3^{x+1} + 2^x} \\ &= \lim_{x \rightarrow \infty} \frac{3^{-x} - 1}{3 + \frac{2^x}{3^x}} \\ &= \frac{0 - 1}{3 + 0} = -\frac{1}{3} \end{aligned}$$

(4)

$$\begin{aligned} \lim_{x \rightarrow 3-0} \frac{|x-3|}{x^2 - x + 6} \\ &= \lim_{x \rightarrow 3-0} \frac{1}{-x - 2} \\ &= -\frac{1}{5} \end{aligned}$$

(5)

$$\begin{aligned} \lim_{x \rightarrow 0} \frac{\sin 5x}{4x} \\ &= \lim_{x \rightarrow 0} \left(\frac{\sin 5x}{5x} \cdot \frac{5x}{4x} \right) \\ &= 1 \cdot \frac{5}{4} = \frac{5}{4} \end{aligned}$$

(6)

$$\begin{aligned} \lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2} \\ &= \lim_{x \rightarrow 0} \frac{\sin x^2}{x^2(1 + \cos x)} \\ &= \lim_{x \rightarrow 0} \frac{\sin x}{x} \lim_{x \rightarrow 0} \frac{\sin x}{x} \lim_{x \rightarrow 0} \frac{1}{1 + \cos x} \\ &= 1 \cdot 1 \cdot \frac{1}{2} = \frac{1}{2} \end{aligned}$$

(7)

$$\begin{aligned} \lim_{x \rightarrow 2} \frac{x-2}{\sqrt{x^2+1} - \sqrt{5}} \\ &= \lim_{x \rightarrow 2} \frac{(x-2)(\sqrt{x^2+1} + \sqrt{5})}{x^2 - 4} \\ &= \lim_{x \rightarrow 2} \frac{\sqrt{x^2+1} + \sqrt{5}}{x+2} \\ &= \frac{2\sqrt{5}}{4} = \frac{\sqrt{5}}{4} \end{aligned}$$

(8)

$$\begin{aligned} \lim_{h \rightarrow 0} (1 + 3h)^{\frac{1}{h}} \\ &= \lim_{h \rightarrow 0} (1 + 3h)^{\frac{3}{3h}} \\ &= e^3 \end{aligned}$$