

微分おさらいテスト NO2

学籍番号

氏名

問1 次の関数を微分せよ.

$$(18)y = \ln 2x$$

$$y' = \frac{1}{2x}(2x)' = \frac{1}{x}$$

$$(19)y = \log_2 |3x - 1|$$

$$y' = \frac{1}{(3x-1)\ln 2}(3x-1)' = \frac{3}{(3x-1)\ln 2}$$

$$(20)y = (x-1)^2 \cdot \sqrt[3]{x+2}$$

$$\ln y = 2 \ln |x-1| + \frac{1}{3} \ln |x+2|$$

$$\frac{dy}{dx} \cdot \frac{1}{y} = \frac{2}{x-1} + \frac{1}{3(x+2)} = \frac{7x+11}{3(x-1)(x+2)}$$

$$\frac{dy}{dx} = \frac{7x+11}{3(x-1)(x+2)}(x-1)^2(x+2)^{\frac{1}{3}} = \frac{(x-1)(7x+11)}{3\sqrt[3]{(x+2)^2}}$$

$$(21)y = a^{-2x}$$

$$y' = (a^{-2x} \ln a)(-2x)' = -2a^{-2x} \ln a$$

問2 次の極限をロピタルの定理を用いて求めよ.

$$(22) \lim_{x \rightarrow 2} \frac{2x^2 - x - 6}{x^3 - 8}$$

$$\lim_{x \rightarrow 2} \frac{(2x^2 - x - 6)'}{(x^3 - 8)'} = \lim_{x \rightarrow 2} \frac{4x - 1}{3x^2} = \frac{7}{12}$$

$$(23) \lim_{x \rightarrow 0} \frac{\varepsilon^x - \varepsilon^{-x}}{\sin x}$$

$$\lim_{x \rightarrow 0} \frac{\varepsilon^x + \varepsilon^{-x}}{\cos x} = 2$$

$$(24) \lim_{x \rightarrow 3} \frac{3x^2 - 11x + 6}{2x^2 - 11x + 15}$$

$$\lim_{x \rightarrow 3} \frac{6x - 11}{4x - 11} = 7$$

$$(25) \lim_{x \rightarrow 1} \frac{\ln x}{x - 1}$$

$$\lim_{x \rightarrow 1} \frac{\frac{1}{x}}{1} = 1$$

$$(26) \lim_{x \rightarrow \infty} \frac{\ln x}{x^2}$$

$$\lim_{x \rightarrow \infty} \frac{\frac{1}{x}}{2x} = \lim_{x \rightarrow \infty} \frac{1}{2x^2} = 0$$

$$(27) \lim_{x \rightarrow +0} \frac{\ln(\sin x)}{\ln x}$$

$$\lim_{x \rightarrow +0} \frac{\frac{(\sin x)'}{\sin x}}{\frac{1}{x}} = \lim_{x \rightarrow +0} \cos x \cdot \frac{x}{\sin x}$$

$$\lim_{x \rightarrow +0} \frac{x}{\sin x} = \lim_{x \rightarrow +0} \frac{1}{\cos x} = 1 \quad \text{より}$$

$$\lim_{x \rightarrow +0} \cos x \cdot \frac{x}{\sin x} = 1$$

$$(28) \lim_{x \rightarrow \infty} \frac{x}{\varepsilon^x}$$

$$\lim_{x \rightarrow \infty} \frac{1}{\varepsilon^x} = 0$$

$$(29) \lim_{x \rightarrow 0} \frac{x - \sin x}{x^2}$$

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

$$(30) \lim_{x \rightarrow \infty} \frac{x^2}{\varepsilon^x}$$

$$\lim_{x \rightarrow \infty} \frac{2x}{\varepsilon^x} = \lim_{x \rightarrow \infty} \frac{2}{\varepsilon^x} = 0$$