

問題 1

(1-1) 積の微分公式  $\{f(x)g(x)\}' = f'(x)g(x) + f(x)g'(x)$  を示せ。

(1-2) 商の微分公式  $\left\{\frac{f(x)}{g(x)}\right\}' = \frac{f'(x)g(x) - f(x)g'(x)}{g(x)^2}$  を示せ。

(1-3) 対数微分の公式  $f'(x) = f(x) \{\log f(x)\}'$  を示せ。

問題 2 以下で与えられた関数  $y$  を  $x$  で微分し,  $y'$  を求めよ. ただし,  $a, b$  は定数とする.

(2-1)  $y = (x^2 + 1)^5(3x + 1)^4$

(2-2)  $y = e^x$

(2-3)  $y = \log x$

(2-4)  $y = \sin x$

(2-5)  $y = \cos x$

(2-6)  $y = x + \sqrt{x^2 + a}$

(2-7)  $y = e^{ax}$

(2-8)  $y = e^{-x^2}$

(2-9)  $y = \tan x$

(2-10)  $y = \sin^{-1} x$

(2-11)  $y = \cos^{-1} x$

(2-12)  $y = \tan^{-1} x$

(2-13)  $y = 3^x$

(2-14)  $y = 2^x + \cos x$

(2-15)  $y = \pi \sin x + \cos x$

(2-16)  $y = e \log x - e$

(2-17)  $y = \log(2x)$

(2-18)  $y = \log_{10} x$

(2-19)  $y = \log x - \log \pi$

(2-20)  $y = x^2 \log 2$

(2-21)  $y = x^2 \log x$

(2-22)  $y = \frac{\sin x}{e^x}$

(2-23)  $y = \frac{x + 1}{x - 1}$

(2-24)  $y = \frac{\log x}{x}$

(2-25)  $y = (1 + x^2)e^{-x}$

(2-26)  $y = e^{\sin x}$

(2-27)  $y = x^x$

(2-28)  $y = x^{\sin x}$

(2-29)  $y = e^{ax} \cos bx$

(2-30)  $y = (\log x)^3$

(2-31)  $y = \frac{1}{\sqrt{\log x}}$

(2-32)  $y = \sqrt{\frac{1 - \cos 2x}{1 + \cos 2x}}$

(2-33)  $y = e^{ax} \frac{a \cos bx + b \sin bx}{a^2 + b^2}$

(2-34)  $y = x \log x - x$

(2-35)  $y = x \cos^2 x$

(2-36)  $y = \frac{1}{2a} \log \left| \frac{x - a}{x + a} \right|$

(2-37)  $y = \log \left( \frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}} \right)$

(2-38)  $y = \log |x + \sqrt{x^2 + 1}|$

(2-39)  $y = \frac{1}{2} \log |\cos x + \sin x| + \frac{x}{2}$

(2-40)  $y = \frac{1}{\sqrt{3}} \log \left| \frac{\sqrt{3} + \tan \frac{x}{2}}{\sqrt{3} - \tan \frac{x}{2}} \right|$

(2-41)  $y = \frac{1}{4\sqrt{2}} \log \left| \frac{x^2 + \sqrt{2}x + 1}{x^2 - \sqrt{2}x + 1} \right| + \frac{1}{2\sqrt{2}} \left( \tan^{-1}(\sqrt{2}x + 1) + \tan^{-1}(\sqrt{2}x - 1) \right)$