

EXERCISE SET 4.2

$$1. \frac{1}{5x}(5) = \frac{1}{x}$$

$$2. \frac{1}{x/3} \frac{1}{3} = \frac{1}{x}$$

$$3. \frac{1}{1+x}$$

$$4. \frac{1}{2+\sqrt{x}} \left(\frac{1}{2\sqrt{x}} \right) = \frac{1}{2\sqrt{x}(2+\sqrt{x})}$$

$$5. \frac{1}{x^2-1}(2x) = \frac{2x}{x^2-1}$$

$$6. \frac{3x^2-14x}{x^3-7x^2-3}$$

$$7. \frac{1}{x/(1+x^2)} \left[\frac{(1+x^2)(1)-x(2x)}{(1+x^2)^2} \right] = \frac{1-x^2}{x(1+x^2)}$$

$$8. \frac{1}{(1+x)/(1-x)} \frac{1-x+1+x}{(1-x)^2} = \frac{2}{1-x^2}$$

$$9. \frac{d}{dx}(2 \ln x) = 2 \frac{d}{dx} \ln x = \frac{2}{x}$$

$$10. 3(\ln x)^2 \frac{1}{x}$$

$$11. \frac{1}{2}(\ln x)^{-1/2} \left(\frac{1}{x} \right) = \frac{1}{2x\sqrt{\ln x}}$$

$$12. \frac{1}{\sqrt{x}} \frac{1}{2\sqrt{x}} = \frac{1}{2x}$$

$$13. \ln x + x \frac{1}{x} = 1 + \ln x$$

$$14. x^3 \left(\frac{1}{x} \right) + (3x^2) \ln x = x^2(1 + 3 \ln x)$$

$$15. 2x \log_2(3-2x) + \frac{-2x^2}{(\ln 2)(3-2x)}$$

$$16. [\log_2(x^2-2x)]^3 + 3x [\log_2(x^2-2x)]^2 \frac{2x-2}{(x^2-2x) \ln 2}$$

$$17. \frac{2x(1 + \log x) - x/(\ln 10)}{(1 + \log x)^2}$$

$$19. \frac{1}{\ln x} \left(\frac{1}{x} \right) = \frac{1}{x \ln x}$$

$$21. \frac{1}{\tan x} (\sec^2 x) = \sec x \csc x$$

$$23. -\frac{1}{x} \sin(\ln x)$$

$$25. \frac{1}{\ln 10 \sin^2 x} (2 \sin x \cos x) = 2 \frac{\cot x}{\ln 10}$$

$$26. \frac{1}{(\ln 10)(1 - \sin^2 x)} (-2 \sin x \cos x) = -\frac{2 \sin x \cos x}{(\ln 10) \cos^2 x} = -\frac{2 \tan x}{\ln 10}$$

$$27. \frac{d}{dx} [3 \ln(x-1) + 4 \ln(x^2+1)] = \frac{3}{x-1} + \frac{8x}{x^2+1} = \frac{11x^2 - 8x + 3}{(x-1)(x^2+1)}$$

$$28. \frac{d}{dx} [2 \ln \cos x + \frac{1}{2} \ln(1+x^4)] = -2 \tan x + \frac{2x^3}{1+x^4}$$

$$29. \frac{d}{dx} \left[\ln \cos x - \frac{1}{2} \ln(4-3x^2) \right] = -\tan x + \frac{3x}{4-3x^2}$$

$$30. \frac{d}{dx} \left(\frac{1}{2} [\ln(x-1) - \ln(x+1)] \right) = \frac{1}{2} \left(\frac{1}{x-1} - \frac{1}{x+1} \right)$$

$$31. \ln|y| = \ln|x| + \frac{1}{3} \ln|1+x^2|, \frac{dy}{dx} = x^3 \sqrt{1+x^2} \left[\frac{1}{x} + \frac{2x}{3(1+x^2)} \right]$$

$$32. \ln|y| = \frac{1}{5} [\ln|x-1| - \ln|x+1|], \frac{dy}{dx} = \frac{1}{5} \sqrt[5]{\frac{x-1}{x+1}} \left[\frac{1}{x-1} - \frac{1}{x+1} \right]$$

$$33. \ln|y| = \frac{1}{3} \ln|x^2-8| + \frac{1}{2} \ln|x^3+1| - \ln|x^6-7x+5|$$

$$\frac{dy}{dx} = \frac{(x^2-8)^{1/3} \sqrt{x^3+1}}{x^6-7x+5} \left[\frac{2x}{3(x^2-8)} + \frac{3x^2}{2(x^3+1)} - \frac{6x^5-7}{x^6-7x+5} \right]$$

$$34. \ln|y| = \ln|\sin x| + \ln|\cos x| + 3 \ln|\tan x| - \frac{1}{2} \ln|x|$$

$$\frac{dy}{dx} = \frac{\sin x \cos x \tan^3 x}{\sqrt{x}} \left[\cot x - \tan x + \frac{3 \sec^2 x}{\tan x} - \frac{1}{2x} \right]$$

$$35. f'(x) = ex^{e-1}$$

$$18. 1/[x(\ln 10)(1 + \log x)^2]$$

$$20. \frac{1}{\ln(\ln(x))} \frac{1}{\ln x} \frac{1}{x}$$

$$22. \frac{1}{\cos x} (-\sin x) = -\tan x$$

$$24. 2 \sin(\ln x) \cos(\ln x) \frac{1}{x} = \frac{\sin(2 \ln x)}{x} = \frac{\sin(\ln x^2)}{x}$$

$$37. (a) \log_x e = \frac{\ln e}{\ln x} = \frac{1}{\ln x}, \frac{d}{dx} [\log_x e] = -\frac{1}{x(\ln x)^2}$$

$$(b) \log_x 2 = \frac{\ln 2}{\ln x}, \frac{d}{dx} [\log_x 2] = -\frac{\ln 2}{x(\ln x)^2}$$

$$36. \ln y = -\sqrt{10} \ln x, \frac{1}{y} \frac{dy}{dx} = -\frac{\sqrt{10}}{x}, \frac{dy}{dx} = -\frac{\sqrt{10}}{x^{1+\sqrt{10}}}$$