Calculus 4.5 #2-42 even

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

$$\frac{dy}{dx} = \frac{-4}{-4x} = \boxed{\frac{1}{x}}$$

(4) $y = \ln(1+x^3)$

$$\boxed{\frac{dy}{dx} = \frac{3x^2}{1+x^3}}$$

(6) $y = \ln|-8x^3+2x|$

$$\boxed{\frac{dy}{dx} = \frac{-24x^2+2}{-8x^3+2x}}$$

(8) $y = \ln(2x+1)^{1/2}$

$$\frac{dy}{dx} = \frac{\frac{1}{2}(2x+1)^{-1/2}(2)}{(2x+1)^{1/2}} = \boxed{\frac{1}{2x+1}}$$

OR

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

$$\frac{dy}{dx} = \frac{1}{2}\cdot\frac{2}{2x+1} = \boxed{\frac{1}{2x+1}}$$

(10) $y = \frac{3}{2}\ln(5x^3-2x)$

$$\frac{dy}{dx} = \frac{3}{2}\cdot\frac{15x^2-2}{5x^3-2x} = \boxed{\frac{45x^2-6}{10x^3-4x}}$$

(12) $y = (3x+7)\boxed{\ln(2x-1)}$

$$\frac{dy}{dx} = (3)\ln(2x-1) + (3x+7)\frac{2}{2x-1} = \boxed{3\ln(2x-1) + \frac{6x+14}{2x-1}}$$

(14) $y = x\cdot\ln|2-x^2|$

$$\frac{dy}{dx} = (1)\ln|2-x^2| + (x)\frac{(-2x)}{2-x^2} = \boxed{\ln|2-x^2| - \frac{2x^2}{2-x^2}}$$

(16) $v = \frac{\ln u}{u^3}$

$$\frac{dv}{du} = \frac{\frac{1}{u}\cdot u^3 - (\ln u)\cdot 3u^2}{u^6} = \frac{u^2 - 3u^2\ln u}{u^6} = \frac{u^2[1-3\ln u]}{u^6}$$

$$\boxed{\frac{dv}{du} = \frac{1-3\ln u}{u^4}}$$

(18) $y = \dfrac{-2\ln x}{3x-1}$

$$\frac{dy}{dx} = \frac{\frac{-2}{x}(3x-1) - (-2\ln x)(3)}{(3x-1)^2} = \boxed{\frac{-6 + \frac{2}{x} + 6\ln x}{(3x-1)^2}}$$

(20) $y = \dfrac{x^3-1}{2\ln x}$

$$\frac{dy}{dx} = \frac{(3x^2)(2\ln x) - (x^3-1)\left(\frac{2}{x}\right)}{(2\ln x)^2} = \boxed{\frac{6x^2\ln x - 2x^2 + \frac{2}{x}}{(2\ln x)^2}}$$

(22) $y = (\ln|x-3|)^{\frac{1}{2}}$

$$\frac{dy}{dx} = \frac{1}{2}(\ln|x-3|)^{-\frac{1}{2}}\left(\frac{1}{x-3}\right) = \boxed{\frac{1}{(2x-6)\sqrt{\ln|x-3|}}}$$

(24) $y = (\ln 4)(\ln|3x|)$

$$\frac{dy}{dy} = \ln 4\left(\frac{3}{3x}\right) = \boxed{\frac{\ln 4}{x}}$$

(26) $y = (e^{2x-1})(\ln|2x-1|)$

$$\frac{dy}{dx} = (e^{2x-1})(2)(\ln(2x-1)) + (e^{2x-1})\frac{2}{2x-1} = \boxed{2(e^{2x-1})\left[\ln(2x-1) + \frac{1}{2x-1}\right]}$$

(28) $p(y) = \dfrac{\ln y}{e^y}$

$$p'(y) = \frac{\left(\frac{1}{y}\right)(e^y) - (\ln y)(e^y)}{(e^y)^2} = \frac{e^y\left[\frac{1}{y} - \ln y\right]}{(e^y)^2} = \boxed{\frac{\frac{1}{y} - \ln y}{e^y}}$$

(30) $y = \log(6x)$

$$\frac{dy}{dx} = \frac{1}{\ln 10} \cdot \frac{6}{6x} = \boxed{\frac{1}{x(\ln 10)}}$$

(32) $y = \log|1-x|$

$$\frac{dy}{dx} = \frac{1}{\ln 10} \frac{(-1)}{(1-x)} = \boxed{\frac{-1}{(1-x)(\ln 10)}}$$

(34) $y = \log_5 (5x+2)^{1/2} = \frac{1}{2} \log_5 (5x+2)$

$$\frac{dy}{dx} = \frac{1}{2} \cdot \frac{1}{\ln 5} \cdot \frac{5}{5x+2} = \boxed{\frac{5}{(10x+4)(\ln 5)}}$$

(36) $y = \frac{3}{2} \log_3 (x^2+2x)$

$$\frac{dy}{dx} = \frac{3}{2} \cdot \frac{1}{\ln 3} \cdot \frac{2x+2}{x^2+2x} = \frac{3}{\cancel{2}} \cdot \frac{1}{\ln 3} \frac{\cancel{2}(x+1)}{x^2+2x} = \boxed{\frac{3x+3}{(\ln 3)(x^2+2x)}}$$

(38) $w = \log_8 (2^p - 1)$

$$\frac{dw}{dp} = \boxed{\frac{(\ln 2)(2^p)}{(\ln 8)(2^p - 1)}}$$

(40) $f(x) = (e^{x^{1/2}})(\ln(x^{1/2}+5))$

$$f'(x) = (e^{\sqrt{x}})(\tfrac{1}{2})(x^{-1/2})(\ln(\sqrt{x}+5)) + (e^{\sqrt{x}})\left(\frac{1}{2\sqrt{x}}\right)\left(\frac{1}{\sqrt{x}+5}\right)$$

$$\boxed{F'x = \frac{e^{\sqrt{x}}}{2\sqrt{x}} \left[\ln(\sqrt{x}+5) + \frac{1}{\sqrt{x}+5} \right]}$$

$$\text{(42)}\quad f(t) = \frac{\ln(t^2+1) + t}{\ln(t^2+1) + 1}$$

$$f'(t) = \frac{\left(\frac{2t}{t^2+1} + 1\right)\left(\ln(t^2+1) + 1\right) - \left(\ln(t^2+1) + t\right)\left(\frac{2t}{t^2+1}\right)}{\left(\ln(t^2+1) + 1\right)^2} \cdot \frac{(t^2+1)}{(t^2+1)}$$

$$f'(t) = \frac{(2t + t^2+1)\left(\ln(t^2+1)+1\right) - \left(\ln(t^2+1) + t\right)2t}{(t^2+1)\left(\ln(t^2+1)\right)^2}$$