Name Key Date

Intro to Calc.

Review 4.2,4.3,4.5

1. Solve each equation.

a) $16^{n-7}+5=24$

$16^{n-7}=19$

$\log_{16} 19 = n-7$

$\frac{\log 19}{\log 16} = n-7$

$1.06 = n-7$

$8.06 = n$

b) $3.4e^{2-2n}-9=-4$

$3.4e^{2-2n}=5$

$e^{2-2n}=1.47$

$\ln 1.47 = 2-2n$

$.39 = 2-2n$

$-1.61 = -2n$

$.805 = n$

c) $\log x + \log 8 = 2$

$\cancel{\log \frac{x}{8}}$ $\log 8x = 2$

$10^2 = 8x$

$100 = 8x$

$12.5 = x$

d) $\ln(-3x-1) - \ln 7 = 2$

$\ln \frac{-3x-1}{7} = 2$

$e^2 = \frac{-3x-1}{7}$

$7.39 = \frac{-3x-1}{7}$

$51.72 = -3x-1$

$52.72 = -3x$

$-17.57 = x$

2. Differentiate each function with respect to x.

a) $y = \ln(\cos x)$

$= \frac{1}{\cos x} \cdot -\sin x$

$= \frac{-\sin x}{\cos x}$

$\boxed{\frac{dy}{dx} = -\tan x}$

b) $y = \ln\left(\frac{2x^2}{x^2+3}\right)$

$= \ln 2x^2 - \ln x^2+3$

$= \frac{1}{2x^2} \cdot 4x - \frac{1}{x^2+3} \cdot 2x$

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

c). $y = \log_3 8x^3$

$= \dfrac{1}{8x^3 \ln 3} \cdot 24x^2$

$\dfrac{dy}{dx} = \dfrac{24x^2}{8x^3 \ln 3} = \boxed{\dfrac{3}{x \ln 3}}$

d). $y = 4^{(x^5+1)^3}$

$= 4^{(x^5+1)^3} \cdot 3(x^5+1)^2 \cdot 5x^4$

$\dfrac{dy}{dx} = \boxed{4^{(x^5+1)^3} \cdot 15x^4(x^5+1)^2}$

e). $y = e^{2x^3}$

$\dfrac{dy}{dx} = e^{2x^3} \cdot 6x^2$

f). $y = \ln(4x^2+3)^4$

$= \dfrac{1}{(4x^2+3)^4} \cdot 4(4x^2+3)^3 \cdot 8x$

$\dfrac{dy}{dx} = \dfrac{32x(4x^2+3)^3}{(4x^2+3)^4} = \boxed{\dfrac{32x}{(4x^2+3)}}$

③. Use logarithmic differentiation to differentiate each function with respect to x.

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

$\ln y = \ln(2x^3+1)^2 + \ln(x+3)^4$

$\ln y = 2\ln(2x^3+1) + 4\ln(x+3)$

$\dfrac{1}{y} \cdot \dfrac{dy}{dx} = 2 \cdot \dfrac{1}{2x^3+1} \cdot 6x^2 + 4 \cdot \dfrac{1}{x+3} \cdot 1$

$\boxed{\dfrac{dy}{dx} = \left(\dfrac{12x^2}{2x^3+1} + \dfrac{4}{x+3}\right)\left((2x^3+1)^2(x+3)^4\right)}$

b). $y = \dfrac{(x^2+4)^4}{(3x^2-5)^2}$

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

$\dfrac{1}{y} \cdot \dfrac{dy}{dx} = 4\ln(x^2+4) - 2\ln(3x^2-5)$

$\dfrac{1}{y} \cdot \dfrac{dy}{dx} = 4 \cdot \dfrac{1}{x^2+4} \cdot 2x - 2 \cdot \dfrac{1}{3x^2-5} \cdot 6x$

$= \left(\dfrac{8x}{x^2+4} - \dfrac{12x}{3x^2-5}\right)\left(\dfrac{(x^2+4)^4}{(3x^2-5)^2}\right)$

④. Use l'Hopital's Rule, if applicable, to find the limit.

a) $\lim_{x \to \infty} \dfrac{8x}{e^{3x}} = \dfrac{\infty}{\infty}$ | $\dfrac{8}{e^{3x} \cdot 3} = \lim_{x \to \infty} \dfrac{8}{3e^{3x}} = \dfrac{8}{\infty} = 0$