Math 131 - Quiz 7

March 22, 2023

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (4 points) Use logarithmic differentiation to find dy/dx when $y = \dfrac{(x+1)^3(x+2)}{x^5(x+3)}$.

$$\ln y = 3\ln(x+1) + \ln(x+2) - 5\ln x - \ln(x+3)$$

$$\frac{1}{y}\frac{dy}{dx} = \frac{3}{x+1} + \frac{1}{x+2} - \frac{5}{x} - \frac{1}{x+3}$$

$$\frac{dy}{dx} = \left(\frac{(x+1)^3(x+2)}{x^5(x+3)}\right)\left(\frac{3}{x+1} + \frac{1}{x+2} - \frac{5}{x} - \frac{1}{x+3}\right)$$

2. (6 points) Determine each derivative.

(a) $\dfrac{d}{dx}\ln(x^7) = \dfrac{d}{dx}\,7\ln x = \dfrac{7}{x}$

(b) $\dfrac{d}{dy}\left[5^{y^2} + (y^2)^5\right] = \dfrac{d}{dy}\,5^{y^2} + \dfrac{d}{dy}\,y^{10}$

$$= 5^{y^2}(2y\ln 5) + 10y^9$$

(c) $\dfrac{d}{dx}\log_3[(5x+1)^4]$

$$= \frac{d}{dx}\,\frac{4}{\ln 3}\ln(5x+1)$$

$$= \frac{4}{\ln 3}\cdot\frac{5}{5x+1}$$