Homework 3.3 – Composite Functions

1. **(1 pt) alfredLibrary/AUCI/chapter3/lesson3/quiz/chain1p.pg**

Consider the following statements:

(a) An environmental study in a community shows that the level of a certain pollutant in the air increases by 0.2 parts per million for every 10 people added to the population.

(b) Census data for the community shows that the population of the community is increasing by 15 people per month.

(c) Therefore, the pollutant is increasing at a rate of 0.3 parts per million per month.

If pollutant level is measured by the variable L in parts per million (ppm), the population is measured by the variable P in heads (h), and time is measured by t in months (mon), then interpret each of the statements above in Leibniz derivative notation:

(a) ? = ____ ?
(b) ? = ____ ?
(c) ? = ____ ?

2. **(1 pt) alfredLibrary/AUCI/chapter3/lesson3/quiz/chain0pet.pg**

If $y = -7\left(x^2+8x+6\right)^3$, then by the chain rule,

$$\frac{dy}{dx} = \_\_\left(\_\_\_\_\right)\_\_\left(\_\_\_\_\right)$$

3. **(1 pt) alfredLibrary/AUCI/chapter3/lesson3/chain9p.pg**

If $f(x) = (x^3+2x+3)^2$,

then $f'(x) =$ _____.

4. **(1 pt) alfredLibrary/AUCI/chapter3/lesson3/chain11pet.pg**

(a) If

$$f(x) = -3\sqrt[20]{(3x^2+2x-2)^{19}} = -3\left(3x^2+2x-2\right)\_\_\_\_$$

then by the chain rule,

$$\frac{df}{dx} = \_\_\left(\_\_\_\_\right)\_\_\left(\_\_\_\_\right)$$

(b) If

$$g(x) = \frac{-3}{\sqrt[20]{(3x^2+2x-2)^{19}}} = -3\left(3x^2+2x-2\right)\_\_\_\_$$

then by the chain rule,

$$\frac{dg}{dx} = \_\_\left(\_\_\_\_\right)\_\_\left(\_\_\_\_\right)$$

5. **(1 pt) alfredLibrary/AUCI/chapter3/lesson3/chain12pet.pg**

Recall the **square root rule:** If $y = \sqrt{x}$, then $y' = \dfrac{1}{2\sqrt{x}}$.

By the chain rule, if $y = \sqrt{g(x)}$, then $y' = \dfrac{1}{2\sqrt{g(x)}} \cdot g'(x) = \dfrac{g'(x)}{2\sqrt{g(x)}}$.

Use this fact to find the derivative of $y = \sqrt{4x^2+3x+7}$. (In other words, try to use the square root rule instead of the power rule.)

$y' =$ _____

6. **(1 pt) alfredLibrary/AUCI/chapter3/lesson3/chain8pet.pg**

Recall the **reciprocal rule:** If $y = \dfrac{1}{x}$, then $y' = -\dfrac{1}{x^2}$.

By the chain rule, if $y = \dfrac{1}{g(x)}$, then $y' = -\dfrac{1}{g(x)^2} \cdot g'(x) = -\dfrac{g'(x)}{g(x)^2}$.

Use this fact to find the derivative of $y = \dfrac{1}{4x^3-3}$. (In other words, try to use the reciprocal rule instead of the power rule.)

$y' =$ _____