QUIZ 13: LESSON 22
MARCH 20, 2017

Write legibly, clearly indicate the question you are answering, and put a box or circle around your final answer. If you do not clearly indicate the question numbers, I will take off points. If you have any questions, raise your hand and I will come over to you.

1. [5 pts] Using the chain rule for multivariable functions, find $\frac{dz}{dt}$ given

$$z = \frac{7x^6}{y^2}, \quad x = 2t^2 + 8, \quad y = \ln t.$$

Leave your answer in terms of x, y, t. You do not need to simplify your answer.

Solution: Then chain rule is given by

$$\frac{dz}{dt} = \frac{\partial z}{\partial x}\frac{dx}{dt} + \frac{\partial z}{\partial y}\frac{dy}{dt}.$$

We find all the derivatives and then plug them into our formula. Write

$$\begin{aligned}
\frac{dx}{dt} &= \frac{d}{dt}(2t^2 + 8) = 4t \\
\frac{dy}{dt} &= \frac{d}{dt}(\ln t) = \frac{1}{t} \\
\frac{\partial z}{\partial x} &= \frac{\partial}{\partial x}\left(\frac{7x^6}{y^2}\right) = \frac{42x^5}{y^2} \\
\frac{\partial z}{\partial y} &= \frac{\partial}{\partial y}\left(\frac{7x^6}{y^2}\right) = \frac{-14x^6}{y^3}
\end{aligned}$$

Thus,

$$\frac{dz}{dt} = \left(\frac{42x^5}{y^2}\right)(4t) + \left(-\frac{14x^6}{y^3}\right)\left(\frac{1}{t}\right).$$

2. [5 pts] Suppose you are the conductor of a train. At the first stop, 6 people get on the train. At the next, 3 people get off and another 5 get on. Over the next 3 stops, 9 people get on the train and 12 people step off. How old is the conductor, assuming that there were initially 20 people on the train and at the last stop everyone steps off. Write a brief sentence explaining your answer.

Solution: This is a stupid question meant to check if you are actually reading the questions rather than just getting distracted by the numbers. The answer is whatever age you are and your explanation ought to be some reference to your birthday.