Students in Calculus I were given the following problem: "Find the derivative of $y = \sec^2(1+3x)$." Four student solutions are below. All four are incorrect. Write a correct solution and decide on a rubric of partial credit if the problm is worth 5 points. For each incorrect solution below, explain the error(s) in the solution and grade the solutions based on your rubric.

1.

$$\begin{aligned} y &= (\sec(u))^2 \qquad u = 1+3x \\ y' &= 2(\sec(1+3x))(\sec x \tan x) \cdot 3 \\ &= 6 \sec x \tan x \sec(1+3x) \end{aligned}$$

2.

$$\begin{aligned} y' &= 2 \cdot 3 \sec(1+3x) \tan(1+3x) \\ &= 6 \sec(1+3x) \tan(1+3x) \end{aligned}$$

3.

$$\begin{aligned} y &= \sec(1+3x) \cdot \sec(1+3x) \\ y' &= \sec\tan(1+3x) \cdot 3 \sec\tan(1+3x) \cdot 3 \\ &= 18 \sec\tan(1+3x) \end{aligned}$$

4.

$$y' = \tan(1+3x) \cdot 3$$