

Derivative Rule Quiz 3

Name: _____ Date: November 14, 2019

Thinking Strategies	Communication	Modelling & Solving

1. How does thinking of units (like kg, L, etc.) help justify the chain rule?

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

2. Determine an expression for dy/dx given

$$y\sqrt{x} + x = y^3$$

$$\frac{d}{dx}(y\sqrt{x} + x) = \frac{d}{dx} y^3$$

$$\frac{dy}{dx} \sqrt{x} + 1 = 3y^2 \frac{dy}{dx}$$

3. Determine an expression for d^2y/dx^2 given

$$y = \frac{w}{x} = \frac{f}{x} = \frac{u}{x} = \frac{z}{x}$$

$$\frac{dy}{dx} = \frac{\left(\frac{d}{dx}w\right) \cdot x - \left(\frac{d}{dx}x\right)w}{x^2}$$

$$= \frac{\frac{dw}{dx} \cdot x - w}{x^2} = \frac{w'x - w}{x^2}$$

$y = \frac{w}{x}$
reciprocal

$y^2 + x^2 = r^2$
circle

$y = ax^2 + bx + c$
quadratic

$y = mx + b$
line

4. Determine the values of m and b so that f is differentiable at $x = 0$.

$$f(x) = \begin{cases} \sqrt{x + \sqrt{2x+1}} & x > 0 \\ mx + b & x \leq 0 \end{cases}$$

$$y = \sqrt{x} + \sqrt{2x+1}$$

$$y' = \frac{1}{2} (x + \sqrt{2x+1})^{-\frac{1}{2}} \left(1 + \frac{1}{2} (2x+1)^{-\frac{1}{2}} \right)$$

