

Chain Rule--Day 2

Questions and More Examples

#4/24

$$y = u - u^2$$

$$u = \sqrt{x} + \sqrt[3]{x}$$

$$\frac{dy}{du} = 1 - 2u$$

$$\frac{du}{dx} = \frac{1}{2\sqrt{x}} + \frac{1}{3\sqrt[3]{x^2}}$$

$$\frac{dy}{dx} = (1 - 2u) \left(\frac{1}{2\sqrt{x}} + \frac{1}{3\sqrt[3]{x^2}} \right)$$

$$= \left[1 - 2(\sqrt{x} + \sqrt[3]{x}) \right] \left[\frac{1}{2\sqrt{x}} + \frac{1}{3\sqrt[3]{x^2}} \right]$$

#20/28

$$y = \csc\left(\frac{x}{3}\right) = \csc\left(\frac{1}{3}x\right)$$

$$\frac{dy}{dx} = -\frac{1}{3} \csc\left(\frac{1}{3}x\right) \cot\left(\frac{1}{3}x\right)$$

#1/31

$h(x) = f(g(x))$ $f(2) = 5$, $f'(2) = 6$, $g(3) = 2$, $g'(3) = 5$
find $h'(3)$.

$$h'(x) = f'(g(x)) g'(x)$$

$$h'(3) = f'(g(3)) g'(3)$$

$$= f'(2) \cdot 5$$

$$= 6 \cdot 5$$

$$= 30.$$

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

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

$$y = \sin^3 \theta^2$$

$$\frac{dy}{dx} = [3\sin^2 \theta^2][\cos \theta^2](2\theta)$$

$$(3\sin^2 \theta^2)(\cos \theta^2)(2\theta)$$

$$y = \sqrt[4]{\frac{x^3 + 1}{x^2 + 1}}$$

$$\frac{dy}{dx} = \frac{\frac{(x^2 + 1)(3x^2) - (x^3 + 1)(2x)}{(x^2 + 1)^2}}{4 \sqrt[4]{\left(\frac{x^3 + 1}{x^2 + 1}\right)^3}}$$

$$\sqrt[n]{f(x)} \rightarrow \frac{f'(x)}{n \sqrt[n]{f(x)^{n-1}}}$$

$$f(x) = \sin^3(\cos(\sin x))$$

$$f'(x) = \left[3 \sin^2(\cos(\sin x)) \right] \left[\cos(\cos(\sin x)) \right] \\ \left[-\sin(\sin x) \right] (\cos x).$$