Worksheet #14: Derivatives - Chain Rule

Spring 2007

Compute the first derivative of each of these functions. Assume Something is something that you can take its derivative. For those who have taken high school calculus, your teacher might have used the variable u instead of the word Something when teaching this topic. Assume all functions unless worthwise stated are functions of t.

$A = (\text{ Something})^3$ $\qquad$ $B = 100(1.12)^{\text{ Something}}$ $\qquad$ $C = 25\ln(\text{ Something})$

Use the power rule with the chain rule.

$$A' = 3(\textit{ Something})^2 \cdot \frac{dS}{dt}$$

Use the exponential rule with the chain rule.

$$B' = 100(1.12)^{\textit{ Something}} \cdot \ln(1.12) \cdot \frac{dS}{dt}$$

Use the logarithm rule with the chain rule.

$$C' = \frac{25}{\textit{Something}} \cdot \frac{dS}{dt}$$

$D = (\text{ Something})^{4.2}$ $\qquad$ $E = \dfrac{20}{\text{Something}} + \dfrac{17}{3}$ $\qquad$ $F = \dfrac{20}{(\text{ Something})^4}$

Use the power rule with the chain rule.

$$D' = 4.2(\textit{ Something})^{3.2} \cdot \frac{dS}{dt}$$

Use the power rule (E can be expressed with a negative exponent) with the chain rule. Also remember the derivative of a constant is zero.

$$E' = -\frac{20}{\textit{Something}^2} \cdot \frac{dS}{dt}$$

Use the power rule (E can be expressed with a negative exponent) with the chain rule.

$$F' = -\frac{80}{(\textit{ Something})^5} \cdot \frac{dS}{dt}$$

$$G = \sqrt[3]{\text{Something}} \qquad H = 20e^{\text{Something}} \qquad I = \frac{1}{\text{Something} + 17}$$

Convert the radical sign to an expression using a fraction as the exponent. Then use the power rule and the chain rule.

$$G' = \frac{1}{3} \frac{1}{\sqrt[3]{\textit{Something}^2}} \cdot \frac{dS}{dt}$$

Use the rule about e^x and the chain rule.

$$H' = 20e^{\textit{Something}} \cdot \frac{dS}{dt}$$

Convert the problem into an expression with a negative exponent. The use the power rule and the chain rule.

$$I' = -\frac{1}{(\textit{Something} + 17)^2} \cdot \frac{dS}{dt}$$

$$G = \sqrt[3]{x^2 + 17} \qquad H = 20e^{-w^2} \qquad I = \frac{1}{4t^3 + 17}$$

$$G = (x^2 + 17)^{1/3}$$
$$G' = \frac{1}{3} \frac{1}{\sqrt[3]{(x^2 + 17)^2}} \cdot 2x = \frac{2x}{3\sqrt[3]{(x^2 + 17)^2}}$$

$$H = 20e^{-w^2}$$
$$H' = 20e^{-w^2} \cdot (-2w) = -40w \cdot e^{-w^2}$$

$$I = (4t^3 + 17)^{-1}$$
$$I' = -\frac{1}{(4t^3 + 17)^2} \cdot 12t^2 = -\frac{12t^2}{(4t^3 + 17)^2}$$