

Homework Set 5

The Product & Quotient Rules

(sect 2.4)

1. Compute: $D((x^2 + 1)(2 - 3x))$
 - a. Find the derivative by using the product rule.

 - b. Find the derivative by multiplying out the function first and not using the product rule.

 - c. Do you get the same function?

2. Compute: $\frac{d}{dt}\left(\frac{3t^5 - 2t\sqrt{t} + t}{t^2}\right)$
 - a. Find the derivative by using the quotient rule.

 - b. Find the derivative by simplifying the function first and not using the quotient rule.

 - c. Do you get the same function?

Compute the derivatives of the following functions.

3. $x \sin x$

4. $x^4 \ln 5x$

5. $\sqrt{x} \cdot e^{-x}$

6. $\frac{x^2}{e^x}$

7. $\frac{x}{x^2+1}$

8. $\frac{1-5x}{3x+2}$

9. $\frac{e^w - e^{-w}}{e^w + e^{-w}}$

10. $x^3 \sin x \cos 3x$

11. $\left(\frac{xe^{3x}}{x^2-4}\right)^5$

12. $\arctan \sqrt{\frac{1-x}{1+x}}$

13. $\cos 3x \left(\frac{x+1}{e^x-1}\right)^7$

Show that the following rule is true using the product or quotient rule as applicable.

14. Show: $\frac{d}{dx} \cot x = -\csc^2 x$

15. Let $f(x)$ and $g(x)$ be differentiable functions such that $f(3) = -2$, $f'(3) = 5$, $g(3) = 3$, and $g'(3) = -1$. Compute the following derivatives:

a. $(fg)'(3) =$

b. $\left(\frac{f}{g}\right)'(3) =$

c. $\frac{d}{dx}[x^2 f(x)]\Big|_{x=3} =$

d. $\frac{d}{dx}\left[\frac{xf(x)+g(x)}{xg(x)}\right]\Big|_{x=3} =$