

Math Xb—Spring 2004

Problems on the Product and Quotient Rules

Note that $\log x = \log_{10} x$ and $\exp(x) = e^x$.

1. Find the derivative of $f(x) = x^2e^x$.
2. Find the derivative of $f(x) = \frac{1-x^2}{1+x^2}$.
3. Find the derivative of $f(x) = x^7 \ln x$.
4. Find the derivative of $f(x) = \frac{e^x}{\ln x}$.
5. Find the derivative of $g(z) = (z^3 - 2z + 5)e^z$.
6. Find the derivative of $f(y) = \frac{\sqrt{y}}{1+e^y}$.
7. Find the derivative of $f(y) = \sqrt{y}(\sin y)(y^2 + 5)$.
8. Find the derivative of $y = \frac{\arctan x}{x^2 + 1}$.

Answers

1. $f'(x) = x^2e^x + 2xe^x$.
2. $f'(x) = \frac{-4x}{(1+x^2)^2}$.
3. $f'(x) = 7x^6 \ln x + x^6$.
4. $f'(x) = \frac{xe^x \ln x - e^x}{x(\ln x)^2}$.
5. $g'(z) = (z^3 - 2z + 5)e^z + (3z^2 - 2)e^z$.
6. $f'(y) = \frac{(1/(2\sqrt{y}))(1+e^y) - e^y \sqrt{y}}{(1+e^y)^2}$.
7. $f'(y) = \frac{1}{2\sqrt{y}}(\sin y)(y^2 + 5) + \sqrt{y}((\cos y)(y^2 + 5) + 2y \sin y)$.
8. $y = \frac{1 - 2x \arctan x}{(x^2 + 1)^2}$.