

Problems for Gateway #4: The Quotient Rule

1. Find the derivative of: $f(x) = \frac{1-x^2}{1+x^2}$.
2. Find the derivative of: $g(x) = \frac{\ln(x)}{x^2}$.
3. Find the derivative of: $p(x) = \frac{e^x}{\ln(x)}$.
4. Find the derivative of: $q(t) = \frac{1+t^2}{e^t}$.
5. Find the derivative of: $k(s) = \frac{\ln(s)-s}{\sqrt{s}}$.
6. Find the derivative of: $m(x) = \frac{x^2}{1+2^x}$.
7. Find the derivative of: $n(t) = \frac{3+2t}{5 \cdot 10^t}$.
8. Find the derivative of: $w(z) = \frac{z}{1-z^2}$.
9. Find the derivative of: $v(x) = \frac{2^x}{4+x^2}$.
10. Find the derivative of: $j(y) = \frac{\sqrt{y}}{1+e^y}$.

ANSWERS:

1. $f'(x) = \frac{-4x}{(1+x^2)^2}$.
2. $g'(x) = \frac{1-2 \cdot \ln(x)}{x^3}$.
3. $p'(x) = \frac{e^x \cdot \ln(x) - e^x \cdot \frac{1}{x}}{[\ln(x)]^2}$.
4. $q'(t) = \frac{-1+2t-t^2}{e^t}$.

$$5. \quad k'(s) = \frac{\sqrt{s} \left(\frac{1}{s} - 1 \right) - \frac{1}{2} s^{-1/2} \cdot (\ln(s) - s)}{s}.$$

$$6. \quad m'(x) = \frac{2x(1+2^x) - x^2 \cdot 2^x \cdot \ln(2)}{[1+2^x]^2}.$$

$$7. \quad n'(t) = \frac{10 \cdot 10^t - (3+2t) \cdot 5 \cdot \ln(10) \cdot 10^t}{[5 \cdot 10^t]^2}.$$

$$8. \quad w'(z) = \frac{(1-z^2) - z \cdot (-2z)}{(1-z^2)^2}.$$

$$9. \quad v'(x) = \frac{\ln(2) \cdot 2^x \cdot (4+x^2) - 2^x \cdot 2x}{(4+x^2)^2}.$$

$$10. \quad j'(y) = \frac{\frac{1}{2} y^{-1/2} \cdot (1+e^y) - y^{1/2} \cdot e^y}{(1+e^y)^2}.$$