This problem explores using logarithmic differentiation to show various identities from earlier in this course.

1. Use logarithmic differentiation on $y = x^n$ to show that $\frac{d}{dx}(x^n) = nx^{n-1}$.
2. Use logarithmic differentiation on $y = f(x)g(h)$ to verify the product rule.
3. Use logarithmic differentiation on $y = \frac{f(x)}{g(x)}$ to verify the quotient rule.