

MA121 Elements of Calculus

Extra Credit 1

Due: 23 February, 2009

Instructions: Show all work relevant to the solution of each problem. i.e. no credit will be given for “just the answers.”

1. Prove the quotient rule.

i.e. Show that $\frac{d}{dx} \frac{f(x)}{g(x)} = \frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$.

Hint. First, recall that $\frac{f(x)}{g(x)} = f(x)(g(x))^{-1}$.

Differentiate the right hand side using the product rule and chain rule. Then simplify.

2. Theorem. A polynomial of degree n can have *at most* n roots.

A. Why is this? Hint. The number of roots corresponds with the number of factors $(x - k)$, where k is a constant.

B. Use the theorem to explain why a polynomial of degree n can't have more than $n - 1$ local extrema.