1. Prove: If f(x) and g(x) are differentiable functions, then $\frac{d}{dx}(f(x) + g(x)) = f'(x) + g'(x)$. (7 points)

2. Let $f(x) = x^4 - 4x^3 + 2$. Can you use the Intermediate Value Theorem to show that f(x) has a root in the interval (0, 1)? If so, fully explain how you would do this. If not, explain why not. (7 points)

3. Let $f(x) = e^x \sin x$. Calculate f'(x) and f''(x) by hand (show the details). You may check the answers using your calculator. (6 points)