

You have 20 minutes to complete this quiz. It's double-sided. You may use your brain and pen/pencil. No other resources are allowed. You will get credit for both answers and work.

PROBLEM ONE [4 PTS.]

Let $M = f'(x_0)$. Consider the approximation $M \approx N(h) = \frac{1}{h}[-f(x_0 - h) + f(x_0)]$. Show that $N(h) = M + K_1h + O(h^2)$ (for some constant K_1) when f is a smooth function.

PROBLEM TWO [4 PTS.]

Starting with the above formula, use extrapolation to derive an $O(h^2)$ formula for $f'(x_0)$.

PROBLEM THREE [4 PTS.]

Find the degree of precision of the following quadrature rule (on the interval $[-3, 3]$):

$$\int_{-3}^3 f(x) dx \approx \sqrt{3}f(-\sqrt{3}) + \sqrt{3}f(+\sqrt{3})$$