Thirty minutes maximum. No aids (book, notes, calculator, phone, etc.) are permitted. Show all work and use proper notation for full credit. Answers should be in reasonably simplified form.

1. (8 points.) Estimate $\int_{-4}^{4} x^2\, dx$ using the midpoint rule with 4 subintervals. Be explicit in showing all your work.

2. (8 points.) Estimate $\int_{-4}^{4} x^2\, dx$ using the trapezoid rule with 4 subintervals. Be explicit in showing all your work.

(Turn over for one more problem)

3. (8 points.) If $f^{(2)}(x)$ is continuous on $[a, b]$ and $|f^{(2)}(x)| \leq M$ on $[a, b]$, then the absolute error obtained from using the midpoint rule with n subintervals is bounded by $\dfrac{M(b-a)^3}{24n^2}$. Find the number of subintervals needed to ensure that the error in estimating $\displaystyle\int_{-4}^{4} x^2 \, dx$ is no more than 0.1. Note that your calculations will not yield a "nice" integer. Leave your answer in exact form.