Numeric Approximation of Definite Integrals

The "error" of an approximation is the difference between the exact value of the integral and the approximation. The "absolute error" is the absolute value of the error. Let E_L, E_R, E_M, E_T, and E_S be the errors of an approximation for left endpoints, right endpoints, midpoints, the trapezoid rule and Simpson's rule, respectively.

For each definite integral below, find its exact value using the Fundamental Theorem of Calculus, then find its approximate value (with $n = 6$) and the corresponding approximate absolute error using:

- Left endpoints of the subintervals
- Right endpoints of the subintervals
- Midpoints of the subintervals
- The trapezoid rule
- Simpson's rule

1. $\displaystyle\int_1^4 \frac{1}{x}\,dx$
2. $\displaystyle\int_0^2 2 - \frac{1}{2}x^2\,dx$