MTH 252Z Lab
Numerical Approximations

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Prompts

1. We have L_n, R_n, M_n, T_n, and S_n. Which one is generally the most accurate? Which two are the least accurate?
2. Which is generally more accurate: T_n or M_n?
3. The integral $\displaystyle\int_2^3 \frac{2}{x \ln x}\, dx$ can be found exactly. We will now focus on approximations.
   (a) Evaluate $\displaystyle\int_2^3 \frac{2}{x \ln x}\, dx$ using integration strategies. Approximate your conclusion to the nearest ten-thousandth.
   (b) Approximate $\displaystyle\int_2^3 \frac{2}{x \ln x}\, dx$ by computing the following. Round each conclusion to the nearest ten-thousandth.
      i. Compute L_4.
      ii. Compute R_4.
      iii. Compute M_4.
      iv. Compute T_4.
      v. Compute S_4.
   (c) Compare the results of the previous computations with the conclusion you found in (a). Which strategy was most accurate? Which was least accurate?
4. An antiderivative for $f(x) = e^{-x^2}$ is difficult to find, but the area underneath the curve from 0 to 1 can still be represented by $\displaystyle\int_0^1 e^{-x^2}\, dx$. Approximate this value to the nearest thousandth by using
   (a) M_4
   (b) T_4
   (c) S_4

   Then find an error bound on each of the strategies used above by using a value of $K = 2$.
   (d) E_M
   (e) E_T
5. The velocity of Supergirl flying through the air (in km/s) is recorded every 5 seconds from the moment she takes flight. The results are provided in the table below:

t (sec)	0	5	10	15	20	25	30	35	40	45	50
$v(t)$ (km/s)	0	80	100	128	144	160	152	136	128	120	136

   Estimate the distance that Supergirl traveled (to the nearest km) by using each of the approximation strategies below.
   (a) T_{10}
   (b) S_{10}