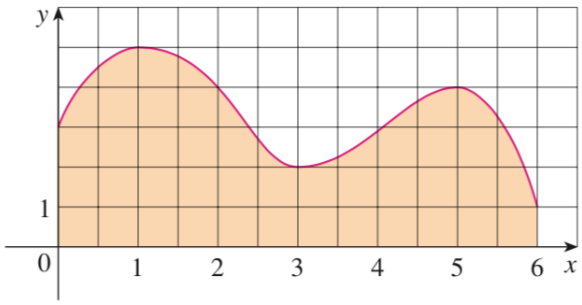
Math 1B: Calculus **Spring 2020**

Discussion 6: Approximate Integration

Instructor: Alexander Paulin Date: Feb 7, 2020

1 Approximate using Midpoint/Trapezoid/Simpson's Rule:

1. Estimate the area under the graph in the figure by using (a) the Trapezoidal Rule, (b) the Midpoint Rule, and (c) Simpson's Rule, each with $n = 6$.



2. Use (a) the Trapezoidal Rule, (b) the Midpoint Rule, and (c) Simpson's Rule to approximate the given integral with $n = 8$:

$$\int_0^2 \sqrt{1 + x^2} dx$$

2 Given error bound, calculate n or vice-versa:

1. (a) Find the approximations T_s and M_s for the integral $\int_0^1 \cos(x^2)dx$.

   (b) Estimate the errors in the approximations of part (a).

   (c) How large do we have to choose n so that the approximations T_n and M_n to the integral in part (a) are accurate to within 0.0001?

2. (a) Find the approximations of T_{10}, M_{10}, and S_{10} for $\int_0^\pi \sin x dx$ and the corresponding errors E_T, E_M. and E_S.

   (b) How large do we have to choose n so that the approximations T_n, M_n, and S_n to the integral in part (a) are accurate to within 0.00001?

3. How large should n be to guarantee that the Simpson's Rule approximation to $\int_0^1 e^{x^2} dx$ is accurate to within 0.00001?