Math 199, Spring 2022
Yigal Kamel
2/18/22

Preparation Assignment 5 - Approximating integrals

Estimated Time: 30 minutes.

Goals: We want to understand Simpson's rule for approximating a definite integral. On this assignment, we'll recall some simpler methods of approximating integrals and build up to Simpson's rule.

Get out a separate piece of paper (or a tablet).

Consider the "Bell curve" function $f(x) = e^{-x^2}$. I mentioned last class that the total area $\int_{-\infty}^{\infty} e^{-x^2} dx$ is finite, but requires multivariable techniques to compute exactly.

1) Sketch the graph of $f(x)$.

2) Describe how you would set up a left endpoint Riemann sum using four rectangles to approximate the area $\int_{-2}^{2} e^{-x^2} dx$. Draw a sketch.

3) Describe how you would use four rectangles to approximate the area $\int_{-2}^{2} e^{-x^2} dx$ using midpoints. Draw a sketch.

4) Describe how you would use four trapezoids to approximate the area $\int_{-2}^{2} e^{-x^2} dx$. Draw a sketch.

5) Describe how you would use four parabolas to approximate the area $\int_{-2}^{2} e^{-x^2} dx$. Draw a sketch.

6) What is Simpson's rule?