

Math 1552, Integral Calculus
Section 8.7: Numerical Integration

Let θ be an angle in radians, $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$, so that $\tan \theta = \frac{1}{2}$.

We can find the value of θ using the integral:

$$\theta = \tan^{-1} \left(\frac{1}{2} \right) = \int_0^{1/2} \frac{1}{1+x^2} dx.$$

1. Estimate the value of θ with the trapezoidal rule using $n = 4$ subintervals.

2. Using the formula for error in the Trapezoidal rule, estimate the largest possible error for your answer to problem 1.

3. The actual value is approximately 0.46365. What is the actual error, and the percent error in your estimate in problem 1?

4. Estimate the value of θ with Simpson's rule using $n = 6$ subintervals.