

Calculus 112 Practice Problems

Section 7.6 Problems #5

5. (a) $\int_0^4 e^x dx = e^x \Big|_0^4 = e^4 - e^0 \approx 53.598 \dots$

(b) Computing the sums directly, since $\Delta x = 2$, we have

$$\text{LEFT}(2) = 2 \cdot e^0 + 2 \cdot e^2 \approx 2(1) + 2(7.389) = 16.778; \quad \text{error} = 36.820.$$

$$\text{RIGHT}(2) = 2 \cdot e^2 + 2 \cdot e^4 \approx 2(7.389) + 2(54.598) = 123.974; \quad \text{error} = -70.376.$$

$$\text{TRAP}(2) = \frac{16.778 + 123.974}{2} = 70.376; \quad \text{error} = 16.778.$$

$$\text{MID}(2) = 2 \cdot e^1 + 2 \cdot e^3 \approx 2(2.718) + 2(20.086) = 45.608; \quad \text{error} = 7.990.$$

$$\text{SIMP}(2) = \frac{2(45.608) + 70.376}{3} = 53.864; \quad \text{error} = -0.266.$$

(c) Similarly, since $\Delta x = 1$, we have $\text{LEFT}(4) = 31.193$; $\text{error} = 22.405$

$$\text{RIGHT}(4) = 84.791; \quad \text{error} = -31.193$$

$$\text{TRAP}(4) = 57.992; \quad \text{error} = -4.394$$

$$\text{MID}(4) = 51.428; \quad \text{error} = 2.170$$

$$\text{SIMP}(4) = 53.616; \quad \text{error} = -0.018$$

(d) For LEFT and RIGHT, we expect the error to go down by $1/2$, and this is very roughly what we see. For MID and TRAP, we expect the error to go down by $1/4$, and this is approximately what we see. For SIMP, we expect the error to go down by $1/2^4 = 1/16$, and this is approximately what we see.