

- Use the Trapezoid rule and midpoint rule with $n = 4$ to approximate the integral $\int_1^5 \frac{1}{x} dx$.
- Consider the integral $\int_0^{0.5} \cos(x^3) dx$. By the Midpoint rule with n equal subintervals, give an estimate for n which guarantee that the error is bounded by $1/10^4$.
- Consider $\int_1^3 \frac{1}{x^2} dx$ using the Trapezoid Rule with $n = 4$. Then use the error bound $|E_T| \leq \frac{k(b-a)^3}{12n^2}$ to estimate the accuracy.
- Evaluate the following improper integral.
 - $\int_1^\infty \frac{\ln x}{x^2} dx$
 - $\int_0^1 \frac{\ln x}{x^2} dx$
 - $\int_{-\infty}^\infty \frac{1}{4+x^2} dx$
 - $\int_0^1 x^{-1/2} dx$
 - $\int_3^\infty \frac{1}{x^2 - x - 2} dx$
- Use comparison Theorem to determine whether the following is convergent or divergent. Justify your answer.
 - $\int_1^\infty \frac{\cos^2 x}{x^3} dx$
 - $\int_0^\infty \frac{1}{\sqrt{x+1}} dx$
- Find the area of the region bounded by the curves given below. Sketch the region, too.
 - $y = x^3 - 2x$ and $y = -x$
 - $x = y^2 - 7$ and $x = y - 1$
- Find the volume of the solid generated by revolving the region between the parabola $x = y^2 + 1$ and the line $x = 3$ about the line $x = 3$. Sketch the region!
- The region in the first quadrant enclosed by the parabola $y = x^2$, the y -axis, and the line $y = 1$ is revolved about the line $x = 3/2$ to generate a solid. Find the volume of the solid.
- Find the arc length of the curve given below.
 - the curve $y = \frac{2}{3}(x-1)^{3/2}, 1 \leq x \leq 4$
 - parametric curve $x = \cos^2 t, y = \sin^2 t, 0 \leq t \leq \frac{\pi}{2}$
- A particle is moving along a straight line so that its velocity at time t is $v(t) = 3t^2$. At what time t during the interval $0 < t < 3$ is its velocity the same as its average velocity over the entire interval?

Answers:

- Trapezoid: 101/60 Midpoint: 496/315 2. $n=14$ (answer may vary) 3. $|E_T| \leq \frac{1}{4}$
- (a) 1 (b) Divergent (c) $\pi/2$ (d) 2 (e) $\frac{1}{3} \ln 4$ 5. (a) Convergent (b) Divergent
- (a) $\frac{1}{2}$ (b) $125/6$ 7. $\frac{64\pi\sqrt{2}}{15}$ 8. $\frac{3\pi}{2}$
- (a) $14/3$ (b) $\sqrt{2}$
- $t = \sqrt{3}$