1. (**Integration by Parts**) Evaluate the integral.

   (a) $\displaystyle\int x\cos 5x\,\mathrm{d}x$

   (b) $\displaystyle\int \arctan x\,\mathrm{d}x$

   (c) $\displaystyle\int (\ln x)^2\,\mathrm{d}x$

   (d) $\displaystyle\int_0^1 (x^2+1)e^{-x}\,\mathrm{d}x$

   (e) $\displaystyle\int_{\sqrt{\frac{\pi}{2}}}^{\sqrt{\pi}} \theta^3\cos(\theta^2)\,\mathrm{d}\theta$

2. (**Trigonometric Integrals**) Evaluate the integral.

   (a) $\displaystyle\int \sin^5(2t)\cos^2(2t)\,\mathrm{d}t$

   (b) $\displaystyle\int \frac{1-\tan^2(x)}{\sec^2(x)}\,\mathrm{d}x$

   (c) $\displaystyle\int \tan(x)\sec^3(x)\,\mathrm{d}x$

   (d) $\displaystyle\int \sin(x)\sec^5(x)\,\mathrm{d}x$

3. (**Trigonometric Substitution**) Evaluate the integral.

   (a) $\displaystyle\int_2^3 \frac{\mathrm{d}x}{(x^2-1)^{3/2}}$

   (b) $\displaystyle\int \frac{\sqrt{1+x^2}}{x}\mathrm{d}x$

   (c) $\displaystyle\int x\sqrt{1-x^4}\mathrm{d}x$

   (d) $\displaystyle\int \frac{x}{\sqrt{1+x^2}}\mathrm{d}x$

4. (**Integration of Rational Functions by Partial Fractions**) Evaluate the integral.

   (a) $\displaystyle\int \frac{5x+1}{(2x+1)(x-1)}\mathrm{d}x$

   (b) $\displaystyle\int_2^3 \frac{x(3-5x)}{(3x-1)(x-1)^2}\mathrm{d}x$

   (c) $\displaystyle\int \frac{\mathrm{d}x}{x^2+x\sqrt{x}}$

   (d) $\displaystyle\int \frac{\mathrm{d}x}{1+e^x}$

Cont.

5. Use Trapezoidal rule, the Midpoint rule, and Simpson's rule to approximate the given integral with the specified value of n.

   (a) $\displaystyle\int_1^2 \sqrt{x^3-1}\mathrm{d}x,\ n=10$

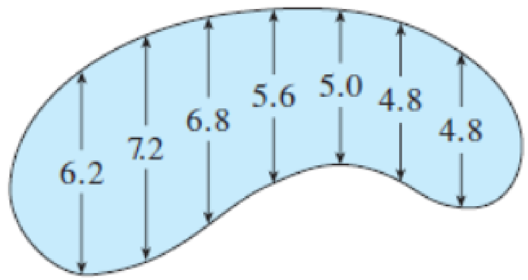
   (b) $\displaystyle\int_0^4 \ln(1+e^x)\mathrm{d}x,\ n=8$

6. Find the approximations $\mathrm{L_n}, \mathrm{R_n}, \mathrm{T_n}$, and $\mathrm{M_n}$ for $\mathrm{n} = 5, 10$, and 20 . Then compute the corresponding errors $\mathrm{E_L}, \mathrm{E_R}, \mathrm{E_T}$, and $\mathrm{E_M}$. (Round your answers to six decimal places. You may wish to use the sum command on a computer algebra system.) What observations can you make? In particular, what happens to the errors when n is doubled?

   (a) $\displaystyle\int_0^1 xe^x\mathrm{d}x$

   (b) $\displaystyle\int_1^2 \frac{1}{x^2}\mathrm{d}x$

7. The widths (in meters) of a kidney-shaped swimming pool were measured at 2-meter intervals as indicated in the figure. Use Simpson's Rule to estimate the area of the pool.



8. Determine whether each integral is convergent or divergent. Evaluate those that are convergent.

   (a) $\displaystyle\int_0^\infty \frac{1}{\sqrt[4]{1+x}}\mathrm{d}x$

   (b) $\displaystyle\int_{-\infty}^0 2^r \mathrm{d}r$

   (c) $\displaystyle\int_2^\infty \frac{\mathrm{d}v}{v^2+2v-3}$

   (d) $\displaystyle\int_{-1}^2 \frac{x}{(x+1)^2}\mathrm{d}x$

The End.