1. Use integration by parts to evaluate these integrals.

   a. $\int_0^1 \cot^{-1} x \, dx$

   b. $\int x^2 e^{5x} \, dx$

   c. $\int x \tan^{-1} x \, dx$

2. Integrate these three trigonometric integrals.

   a. $\int \tan^6 x \ \sec^6 x \, dx$

   b. $\int \sin^2 3x \ \cos^2 3x \, dx$

   c. $\int \tan^3 x \ \sec^3 x \, dx$

3. Evaluate these integrals by trigonometric substitution.

   a. $\int \frac{x^3}{\sqrt{1-x^2}} \, dx$

   b. $\int \frac{\sqrt{x^2-9}}{x^4} \, dx$

4. Evaluate these integrals by partial fractions.

   a. $\int \frac{2x-1}{(x+4)(x-1)(x-3)} \, dx$

   b. $\int \frac{x^3+5x^2-8x+7}{x^2-3x+2} \, dx$

   c. $\int \frac{3x^2-4x+5}{(x-1)(x^2+1)} \, dx$

5. Write out the form for a partial fractions decomposition for this rational function using the letters A through I in the numerators. Do not solve for the numerical values for the letters.

$$\frac{1}{x^2(x-5)^3(x^2+16)^2}$$

6. For the integral $I=\int_1^4 x^{1/2}\,dx$ do the following.

a. Find T_6 , M_6 and S_6.

b. Find bounds for the errors E_T , E_M and E_S for n=6.

c. Find T_3 and M_3 and demonstrate that $S_6 = \frac{1}{3}T_3 + \frac{2}{3}M_3$.

d. Calculate the value of $I=\int_1^4 x^{1/2}\,dx$

using the Fundamental theorem of Calculus.

e. Make a table for n = 6 showing and labeling

(1) the actual values of T_6 , M_6 , S_6 *and* I.

(2) the actual errors in T_6 , M_6 *and* S_6 .

(3) the calculated bounds for the errors E_T , E_M *and* E_S

(4) the relative errors.

f. Find the size of n so that the error bounding E_S is less than 0.0001.

7. Determine whether the improper integrals converge or diverge.

a. $\int_2^\infty \frac{1}{(x-1)^{3/2}}\,dx$

b. $\int_1^2 \frac{1}{(x-1)^{3/2}}\,dx$

c. $\int_0^\infty x\,e^{-x}\,dx$

d. $\int_0^1 \frac{\ln x}{\sqrt{x}}\,dx$