1. Find the integral

   (a) $\int (x^3 + 2x^2 - x)e^{3x}\ dx$

   (b) $\int \frac{\ln x}{x^2} dx$

   (c) $\int e^{3x} \sin(2x)\ dx$

2. Find the integral

   (a) $\int \sin^3 x \cos^4 x\ dx$

   (b) $\int_0^{\pi/8} \sin^2(2x)\cos^3(2x)\ dx$

   (c) $\int \sin^2 x \cos^4 x\ dx$

   (d) $\int_0^{\pi/4} \tan^4 x \sec^4 x\ dx$

   (e) $\int \tan^3 x \sec^3 x\ dx$

3. Write out the form of the partial fraction decomposition (do not try to solve)

$$\frac{20x^3 + 12x^2 + x}{(x^3 - x)(x^3 + 2x^2 - 3x)(x^2 + x + 1)(x^2 + 9)^2}$$

4. Evaluate the integral

   (a) $\int (4x^2 - 25)^{-3/2}\ dx$

   (b) $\int \frac{(x-1)^2}{5\sqrt{24 - x^2 + 2x}} dx$

   (c) $\int \frac{5x^2 + x + 12}{x^3 + 4x} dx$

5. Use (a) the Midpoint Rule and (b) the Trapezoidal Rule to approximate the integral

$$\int_1^3 x^2 dx$$

   with $n = 4$.

6. Determine whether the given integral is convergent or divergent.

   (a) $\int_1^{\infty} \frac{4 + \cos^4 x}{x} dx$

   (b) $\int_1^{\infty} \frac{3 + \sin x}{x^2} dx$

(c) $\int_{0}^{\infty} \frac{1}{\sqrt{x} + e^{4x}} dx$

7. Compute the following integrals or show that they diverge.

(a) $\int_{e}^{\infty} \frac{dx}{x \ \ln^5 x}$

(b) $\int_{-\infty}^{0} (1 + x)e^{x} \ dx$

(c) $\int_{-\infty}^{\infty} \frac{6x^5}{(x^6 + 3)^3} dx$

(d) $\int_{0}^{2019} \frac{1}{\sqrt{2019 - x}} dx$