Test 1.

1. Evaluate the integrals:

(a)

$$\int \sin 2x \sin x \, dx$$

(b)

$$\int \frac{dt}{t^2 + t^3}$$

(c)

$$\int \frac{x^{1/2} dx}{1 + x^{1/4}}$$

(d)

$$\int \cos \sqrt{x} \, dx$$

2. Determine whether the integrals are divergent. Evaluate those that are convergent.

(a)

$$\int_0^1 \frac{dx}{x^3}$$

(b)

$$\int_0^\infty x e^{-x} dx$$

3. Find n for which the trapezoid rule calculates the integral

$$\int_1^2 e^{1/x} \, dx$$

with error less than 0.01.

4. Prove that the improper integral

$$\int_{-\infty}^\infty e^{-x^2 - 2x} dx$$

is convergent.

Test 2.

1. Evaluate the integrals:

(a)

$$\int \sin^3 x \cos x \, dx$$

(b)

$$\int \frac{x^3}{(x-1)^{13}} dx$$

(c)

$$\int \frac{dx}{e^{2x} + 3e^x + 2}$$

(d)

$$\int \left(4 - x^2\right)^{1/2} dx$$

2. Using integration by parts show that if

$$I_n = \int_0^{\pi/2} \sin^n x dx,$$

then

$$I_n = \frac{n-1}{n} I_{n-2}.$$

3. Give an estimate for the number n in the midpoint method to evaluate

$$\int_0^{10} \cos x^2 \, dx$$

with error less than 10^{-5}.

4. Determine whether the following integral is divergent or convergent.

$$\int_0^{\pi/2} \sec x \, dx.$$

Test 3.

1. Evaluate the integrals:

(a)

$$\int \frac{\ln x}{x\,(\ln x + 1)} dx$$

(b)

$$\int \frac{x^2}{(x+1)^{2008}} dx$$

(c)

$$\int \frac{1 - \tan x}{1 + \tan x} dx$$

2. Evaluate the definite integral

$$\int_0^{\pi} e^{2x} \sin x \, dx.$$

3. Estimate the error in the midpoint rule for the integral

$$\int_0^1 \cos x^2 \, dx$$

if $n = 100$.

4. Evaluate the improper integral

$$\int_0^{\infty} \frac{dx}{x^2 + 4x + 3}$$