

1. Suppose $f''(x) = x - \frac{1}{x^2}$ such that $f(-1) = 4$ and $f'(2) = 3$, find an expression for $f(x)$.

2. Evaluate the integral

a) $\int x^3 + 2x^2 + \frac{x}{2} + 4dx$

b) $\int xe^{(x^2+1)} + xdx$

c) $\int x^2 \cos(x^3)dx$

d) $\int \frac{x}{\sqrt{x^2+1}}dx$

e) $\int \sin^3 x \cos x dx$

f) $\int x^2 e^x dx$

g) $\int \frac{1}{x^2 + 3x + 2}dx$

h) $\int \frac{\sin(\ln x)}{x}dx$

i) $\int \frac{1}{16-9x^2}dx$

j) $\int \frac{x^3}{\sqrt{4-x^2}}dx$

k) $\int \frac{x^3}{x^2-2x-3}dx$

l) $\int_a^x e^x dx$

m) $\int \sin 2x \cos 3x dx$

n) $\int \frac{1}{x(1-\ln x)}dx$

o) $\int \frac{\sin 3x}{\cos x}dx$

p) $\int \frac{1}{4x^2-4x+5}dx$

q) $\int \frac{3x+2}{(1+x)^2(x-2)}dx$

r) $\int \frac{x^3+2x^2}{(x-1)(x^2+2x+2)}dx$

s) $\int \frac{2x-1}{x^4+x^2+1}dx$

3) Evaluate the integral

a) $\int \frac{\cosh 2x}{1+\sinh 2x}dx$

b) $\int e^x \cosh x dx$

c) $\int \frac{\sinh(\frac{1}{x})}{x^2}dx$

d) $\int_0^1 \frac{x}{\sqrt{1+x^4}}dx$

4) Evaluate the following indefinite integrals

a) $\int_0^2 x^2 + 1dx$

b) $\int_{-\pi/2}^{\pi/2} x^2 \cos x dx$

c) $\int_2^5 |x-3|dx$

d) $\int_{-1}^1 x(1-x^2)^5 dx$

e) $\int_1^2 \sqrt{x} + \frac{1}{\sqrt{x}}dx$

f) $\int_0^\pi \sin^2 x \cos^3 x dx$

g) $\int_0^1 \sin^{-1} x dx$

h) $\int_0^4 \sqrt{16-x^2}dx$

i) $\int_{-1}^2 \frac{x}{x^2+2x+10}dx$

5) Evaluate the following definite integrals

a) $\int_0^2 x^2 + 1dx$

b) $\int_{-\pi/2}^{\pi/2} x^2 \cos x dx$

c) $\int_2^5 |x-3|dx$

d) $\int_{-1}^1 x(1-x^2)^5 dx$

e) $\int_1^2 \sqrt{x} + \frac{1}{\sqrt{x}}dx$

f) $\int_0^\pi \sin^2 x \cos^3 x dx$

g) $\int_0^1 \sin^{-1} x dx$

h) $\int_0^4 \sqrt{16-x^2}dx$

i) $\int_{-1}^2 \frac{x}{x^2+2x+10}dx$

5) Show that $\int_0^\pi \frac{x}{1+\sin x}dx = \pi$

6) Evaluate the following improper integrals whenever converges.

a) $\int_3^4 \frac{1}{(x-3)^2}dx$

b) $\int_0^2 \frac{x}{\sqrt{4-x^2}}dx$

c) $\int_0^1 \frac{1}{x^3+x}dx$

d) $\int_0^\infty \frac{1}{e^x+1}dx$

e) $\int_0^1 \frac{1}{e^x-e^{-x}}dx$

f) $\int_2^\infty \frac{1}{x(\ln x)^3}dx$

g) $\int_{\pi/4}^{\pi/2} \sec x dx$

h) $\int_{-\infty}^\infty xe^{-x^2}dx$

i) $\int_{-\infty}^\infty \frac{1}{x^2-6x+10}dx$

7) Find the area of the region bounded by each of the given equations

a) $y = x, x = 2$ and $y = 0$

and $y = 0$

f) $y = x^2 - 4, y = 4 - x^2$

b) $y = x^2, x = -2, x = 2$
and $y = 0$

d) $y = x^2, y = x$

g) $y = x(x - 2)^2, y = 0$

c) $y = \sin x, x = -\pi, x = \pi$

e) $y = x^3, y = x$

h) $y^2 = 6x, x^2 = 6y$

8) Find the area of the region between the graphs of

a) $f(x) = x^2 + x$ and $g(x) = 3x^2 - x$

b) $y^2 = x$ and $y = x - 2$

9) Determine the area of the region enclosed by the ellipse $b^2x^2 + a^2y^2 = (ab)^2$.