## **Tutorial 8**

1. Find the following integrals:

(a) 
$$\int \frac{2}{3} dx$$

(b) 
$$\int \pi^2 dx$$

(c) 
$$\int x^8 dx$$

(a) 
$$\int \frac{2}{3} dx$$
 (b)  $\int \pi^2 dx$  (c)  $\int x^8 dx$  (d)  $\int x^{-\frac{2}{3}} dx$  (e)  $\int \frac{1}{x^4} dx$  (f)  $\int \sqrt[3]{x} dx$  (g)  $\int \sqrt[3]{x^2} dx$  (h)  $\int 6x^3 dx$ 

(e) 
$$\int \frac{1}{x^4} dx$$

(f) 
$$\int \sqrt[3]{x} dx$$

(g) 
$$\int \sqrt[3]{x^2} dx$$

(h) 
$$\int 6x^3 dx$$

(i) 
$$\int \frac{1}{3\pi} t \ dt$$

(j) 
$$\int \frac{\pi^2}{3} t^2 dt$$

(k) 
$$\int \frac{3}{r^2} dx$$

(I) 
$$\int 5\sqrt{x} dx$$

- (i)  $\int \frac{1}{3\pi} t \, dt$  (j)  $\int \frac{\pi^2}{3} t^2 dt$  (k)  $\int \frac{3}{x^2} \, dx$  (l)  $\int 5\sqrt{x} \, dx$  (m)  $\int \frac{1}{\sqrt{x}} \, dx$  (n)  $\int \frac{1}{5\sqrt{t^2}} \, dt$
- 2. Find the following indefinite integrals:

(a) 
$$\int (x^2 + x + 3) dx$$

(a) 
$$\int (x^2 + x + 3) dx$$
 (b)  $\int (7 - 5x - 3x^2) dx$  (c)  $\int (4t^2 + 3t - 2) dt$ 

(c) 
$$\int (4t^2 + 3t - 2)dt$$

$$(d) \int (x+3)^2 dx$$

(e) 
$$\int \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right) dx$$

(f) 
$$\int \left(\frac{2}{x^2} - 3x^2 + 4\right) dx$$

$$(\mathsf{g})\int \left(\frac{5}{x^2} - \frac{3}{x^4}\right) dx$$

$$(\mathsf{h}) \int \left(8\sqrt{x} + \frac{1}{4\sqrt{x}}\right) dx$$

(d) 
$$\int (x+3)^2 dx$$
 (e)  $\int \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right) dx$  (f)  $\int \left(\frac{2}{x^2} - 3x^2 + 4\right) dx$  (g)  $\int \left(\frac{5}{x^2} - \frac{3}{x^4}\right) dx$  (i)  $\int \left(2x^3 + \frac{1}{\sqrt{x}} - \frac{2}{x^2}\right) dx$ 

3. Evaluate the following definite integrals:

(a) 
$$\int_0^2 (4t^2 - t) dt$$

(b) 
$$\int_{1}^{2} \frac{2t^2+1}{t^2} dt$$

(c) 
$$\int_{1}^{3} 2r(r-2)dr$$

(a) 
$$\int_0^2 (4t^2 - t)dt$$
 (b)  $\int_1^2 \frac{2t^2 + 1}{t^2} dt$  (c)  $\int_1^3 2r(r - 2)dr$  (d)  $\int_1^4 (x + 1)(2x + 1) dx$  (e)  $\int_0^1 \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx$ 

(e) 
$$\int_0^1 \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx$$

4. Find the following Indefinite Integrals:

(a) 
$$\int (-6x + 1) dx$$

(a) 
$$\int (-6x + 1) \ dx$$
 (b)  $\int \left(x^3 + 6\sqrt{x} - \frac{1}{x^2}\right) dx$  (c)  $\int \left(\frac{x^4 + 7x}{x^3}\right) dx$  (d)  $\int (2 - 3x)^2 dx$ 

(c) 
$$\int \left(\frac{x^4 + 7x}{x^3}\right) dx$$

(d) 
$$\int (2-3x)^2 dx$$

5.

(a) 
$$\int (1+x)^3 dx$$

(b) 
$$\int (3x-2)^4 dx$$

(c) 
$$\int 2x(x^2+2)^4 dx$$

(d) 
$$\int x^2(x^3+4)^8 dx$$

Evaluate the followings: (a) 
$$\int (1+x)^3 dx$$
 (b)  $\int (3x-2)^4 dx$  (c)  $\int 2x(x^2+2)^4 dx$  (d)  $\int x^2(x^3+4)^8 dx$  (e)  $\int (2x^2-1)(2x^3-3x+9)^{\frac{1}{3}} dx$  (f)  $\int \frac{x}{\sqrt{3-5x^2}} dx$  (g)  $\int x\sqrt{1-x^2} dx$ 

(f) 
$$\int \frac{x}{\sqrt{3-5x^2}} dx$$

$$(g) \qquad \int x\sqrt{1-x^2}\,dx$$

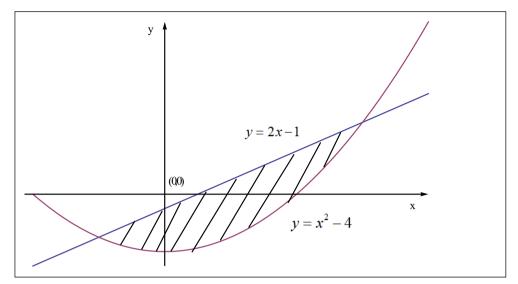
Find the following indefinite integrals by substitution method. 6\*.

$$(a)\int 4x(x^2+3)^4dx$$

$$(b) \int \frac{5x}{\sqrt{7-2x^2}} dx$$

7.

- Show that the points of intersection of the curves y=2x-1 and  $y=x^2-4$  are (-1,-3)and (3,5). Hence, find the shaded area bounded by the curves in the figure below. (a)
- (b)



## **Answers**

1. (a) 
$$\frac{2}{3}x + C$$

(b) 
$$\pi^2 x + C$$

(c) 
$$\frac{1}{9}x^9 + C$$

(a) 
$$\frac{2}{3}x + C$$
 (b)  $\pi^2 x + C$  (c)  $\frac{1}{9}x^9 + C$  (d)  $3x^{\frac{1}{3}} + C$ 

(e) 
$$-\frac{1}{3x^3} + C$$
 (f)  $\frac{3}{4}x^{\frac{4}{3}} + C$  (g)  $\frac{3}{5}x^{\frac{5}{3}} + C$ 

$$(f) \frac{3}{4} x^{\frac{4}{3}} + 0$$

(g) 
$$\frac{3}{5}x^{\frac{5}{3}} + 6$$

(h) 
$$\frac{3}{2}x^4 + C$$

(i) 
$$\frac{1}{6\pi}t^2 + 0$$

(j) 
$$\frac{\pi^2}{9}t^3 + 6$$

$$(k) - \frac{3}{x} + 0$$

(i) 
$$\frac{1}{6\pi}t^2 + C$$
 (j)  $\frac{\pi^2}{9}t^3 + C$  (k)  $-\frac{3}{r} + C$  (l)  $\frac{10}{3}x^{\frac{3}{2}} + C$ 

$$(m)2x^{\frac{1}{2}} + C$$

(m)
$$2x^{\frac{1}{2}} + C$$
 (n)  $\frac{5}{3}t^{\frac{3}{5}} + C$ 

2. (a) 
$$\frac{x^3}{3} + \frac{x^2}{2} + 3x + C$$
 (b)  $7x - \frac{5}{2}x^2 - x^3 + C$  (c)  $\frac{4}{3}t^3 + \frac{3}{2}t^2 - 2t + C$ 

(b)
$$7x - \frac{5}{2}x^2 - x^3 + C$$

(c) 
$$\frac{4}{3}t^3 + \frac{3}{2}t^2 - 2t + 6$$

(d) 
$$\frac{x^3}{3} + 3x^2 + 9x + C$$

$$(e)^{\frac{2}{3}}x^{\frac{3}{2}} - 2x^{\frac{1}{2}} + C$$

(d) 
$$\frac{x^3}{3} + 3x^2 + 9x + C$$
 (e)  $\frac{2}{3}x^{\frac{3}{2}} - 2x^{\frac{1}{2}} + C$  (f)  $-\frac{2}{x} - x^3 + 4x + C$ 

$$(g) - \frac{5}{r} + \frac{1}{r^3} + C$$

$$(h)^{\frac{16}{3}}x^{\frac{3}{2}} + \frac{1}{2}x^{\frac{1}{2}} + C$$

$$(h)^{\frac{16}{3}}x^{\frac{3}{2}} + \frac{1}{2}x^{\frac{1}{2}} + C \qquad \qquad (i)^{\frac{1}{2}}x^4 + 2x^{\frac{1}{2}} + \frac{2}{x} + C$$

3. (a) 
$$8\frac{2}{3}$$

5.

(b) 
$$2\frac{1}{2}$$

(c) 
$$1\frac{1}{3}$$

4. (a) 
$$-3x^2 + x + 0$$

4. (a) 
$$-3x^2 + x + C$$
 (b)  $\frac{x^4}{4} + 4x^{\frac{3}{2}} + \frac{1}{x} + C$  (c)  $\frac{x^2}{2} - \frac{7}{x} + C$  (d)  $4x - 6x^2 + 3x^3 + C$ 

(c) 
$$\frac{x^2}{2} - \frac{7}{x} + C$$

(d) 
$$4x - 6x^2 + 3x^3 + 6$$

(a) 
$$67\frac{1}{3}$$

(b) 
$$2\frac{2}{3}$$

6. a) 
$$\frac{(1+x)^4}{4} + C$$
 b)  $\frac{(3x-2)^5}{15} + C$  c)  $\frac{(x^2+2)^5}{5} + C$ 

$$\frac{15}{15} + C$$

d) 
$$\frac{(x^3+4)^9}{27} + C$$

d) 
$$\frac{(x^3+4)^9}{27} + C$$
 e)  $\frac{(2x^3-3x+9)^{\frac{4}{3}}}{4} + C$   
f)  $\frac{-1}{5}\sqrt{3-5x^2} + C$  g)  $-\frac{1}{3}(1-x^2)^{\frac{3}{2}} + C$ 

f) 
$$\frac{-1}{5}\sqrt{3-5x^2}+C$$

g) 
$$-\frac{1}{3}(1-x^2)^{\frac{3}{2}}+C$$

7\* (a) 
$$\frac{2}{5}(x^2+3)^5+C$$

7\* (a) 
$$\frac{2}{5}(x^2+3)^5 + C$$
 (b)  $-\frac{5}{2}(7-2x^2)^{\frac{1}{2}} + C$ 

8. (ii) 
$$10\frac{2}{3}$$
 units<sup>2</sup>