

## MATHEMATICS ASSIGNMENT FOR L5 ALL

Find the following integrals.

1.  $\int (5x^2 - 8x + 5) dx$

2.  $\int (-6x^3 + 9x^2 + 4x - 3) dx$

3.  $\int (x^{\frac{3}{2}} + 2x + 3) dx$

4.  $\int \left( \frac{8}{x} - \frac{5}{x^2} + \frac{6}{x^3} \right) dx$

5.  $\int \left( \sqrt{x} + \frac{1}{3\sqrt{x}} \right) dx$

6.  $\int (12x^{\frac{3}{4}} - 9x^{\frac{5}{3}}) dx$

7.  $\int \frac{x^2 + 4}{x^2} dx$

8.  $\int \frac{1}{x\sqrt{x}} dx$

9.  $\int (1 + 3t)t^2 dt$

10.  $\int (2t^2 - 1)^2 dt$

11.  $\int y^2 \sqrt[3]{y} dy$

12.  $\int d\theta$

13.  $\int 7 \sin(x) dx$

14.  $\int 5 \cos(\theta) d\theta$

15.  $\int 9 \sin(3x) dx$

16.  $\int 12 \cos(4\theta) d\theta$

17.  $\int 7 \cos(5x) dx$

18.  $\int 4 \sin\left(\frac{x}{3}\right) dx$

19.  $\int 4e^{-7x} dx$

20.  $\int 9e^{\frac{x}{4}} dx$

21.  $\int -5 \cos \pi x dx$

22.  $\int -13e^{6t} dt$

Q23.

Find  $\int \left( x^2 - \frac{1}{x^2} + \sqrt[3]{x} \right) dx$ .

**(Total 4 marks)**

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Q24.

Find  $\int (2 + 5x^2)dx$ .

**(Total 3 marks)**

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Q25.

For the curve  $C$  with equation  $y = f(x)$ ,

$$\frac{dy}{dx} = x^3 + 2x - 7.$$

(a) Find  $\frac{d^2y}{dx^2}$ .

**(2)**

(b) Show that  $\frac{d^2y}{dx^2} \geq 2$  for all values of  $x$ .

**(1)**

Given that the point  $P(2, 4)$  lies on  $C$ ,

(c) find  $y$  in terms of  $x$ ,

**(5)**

(d) find an equation for the normal to  $C$  at  $P$  in the form  $ax + by + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers.

**(5)**

**(Total 13 marks)**

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## PART 2: INTEGRATE USING SUBSTITUTION METHOD

1. In each case the integrand can be written as  $f(g(x))g'(x)$ . Identify the functions  $f$  and  $g$  and use the general result on page 7 to complete the integration.

(a)  $\int 2xe^{x^2-5}dx$       (b)  $\int -2x \sin(1-x^2)dx$       (c)  $\int \frac{\cos x}{1+\sin x}dx$ .

2. In each case use the given substitution to find the integral:

(a)  $\int -2xe^{-x^2}dx$ ,       $u = -x^2$ .

(b)  $\int x \sin(2x^2)dx$ ,       $u = 2x^2$ .

(c)  $\int_0^5 x^3\sqrt{x^4+1}dx$ ,       $u = x^4 + 1$ .

3. In each case use a suitable substitution to find the integral.

(a)  $\int 5x\sqrt{1-x^2}dx$       (b)  $\int \frac{dx}{\sqrt{x}(1+\sqrt{x})^2}$       (c)  $\int x^4(1+x^5)^3dx$

(d)  $\int \frac{x^3}{\sqrt{x^4+16}}dx$       (e)  $\int \frac{\cos x}{(5+\sin x)^2}$       (f)  $\int_0^1 \frac{x^3}{\sqrt{x^4+12}}dx$

(g)  $\int 5x^2\sqrt{1-x^3}dx$       (h)  $\int e^{\cos x} \sin x dx$       (i)  $\int e^{\sin x} \cos x dx$ .

GOOD LUCK!!!!!!