

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
JABATAN PENGAJIAN POLITEKNIK  
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR  
SESI JUN 2014

**BA201 : ENGINEERING MATHEMATICS 2**

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**TARIKH : 03 NOVEMBER 2014**  
**MASA : 8.30 AM - 10.30 AM (2 JAM)**

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Kertas ini mengandungi **EMPAT BELAS (14)** halaman bercetak.

Bahagian A: Struktur (1 soalan)

Bahagian B: Struktur (4 soalan)

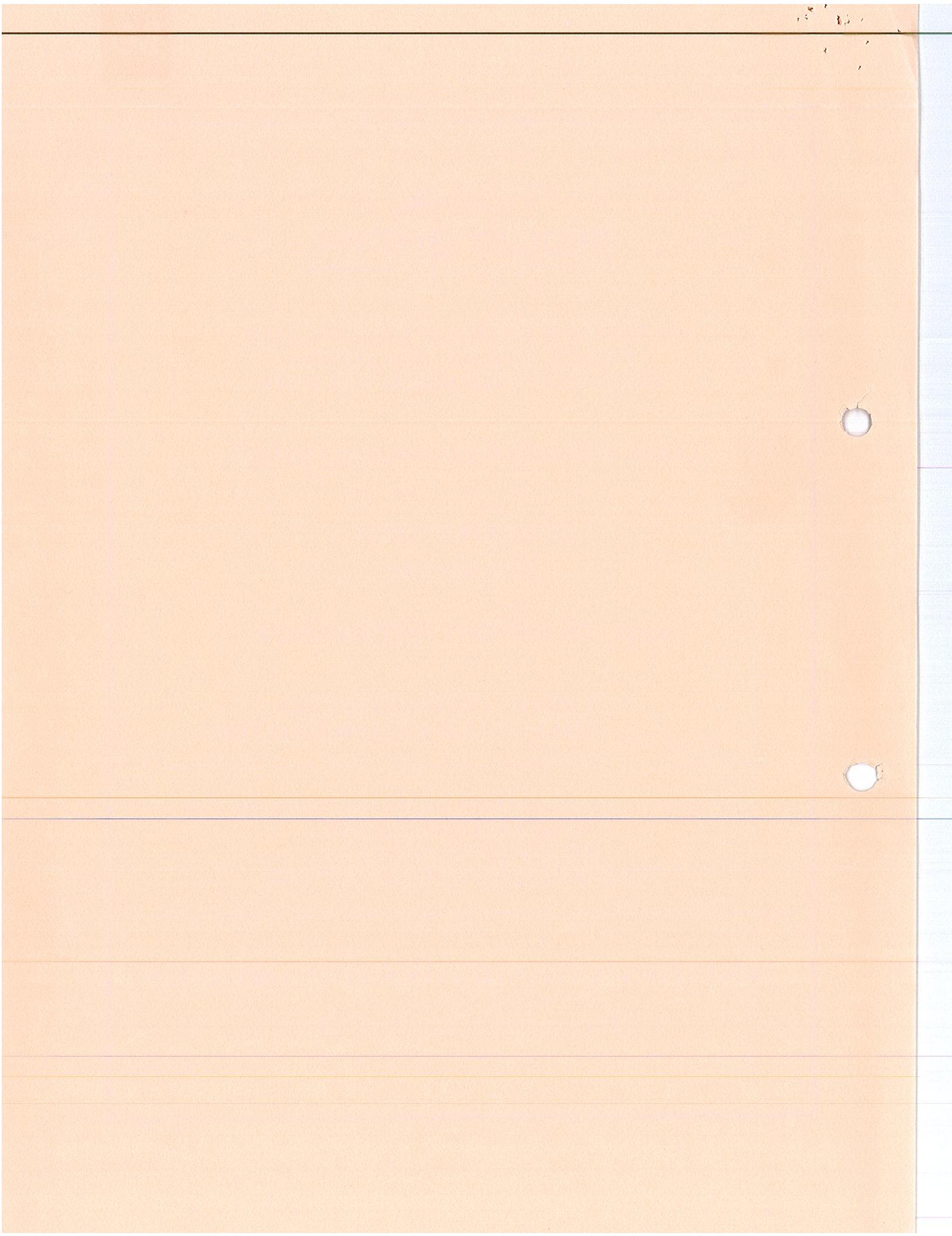
Dokumen sokongan yang disertakan : Formula

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**JANGAN BUKA KERTAS SOALANINI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

SULIT



**SECTION A : 25 MARKS****BAHAGIAN A : 25 MARKAH****INSTRUCTION:**

This section consists of **ONE (1) compulsory** structured question.

**ARAHAN:**

*Bahagian ini mengandungi SATU (1) soalan berstruktur yang WAJIB dijawab.*

**QUESTION 1****SOALAN 1**CLO1  
C2

- (a) Solve the following expressions and write each answer in the form of
- $a + bi$
- .

*Selesaikan ungkapan berikut dan tuliskan jawapan dalam bentuk  $a + bi$ .*

i.  $(4 - 8i) - (-5 + 10i)$

[2 marks]

[2 markah]

ii.  $(8 - 3i)(5 - 2i)$

[3 marks]

[3 markah]

iii.  $-3(-5 + 2i)$

[1 mark]

[1 markah]

CLO1  
C2

- (b) Find the value of
- $x$
- and
- $y$
- , for the following equation :

*Cari nilai  $x$  dan  $y$  bagi persamaan berikut :*

$$(2x - yi)(6 + i) = (1 + 2i)$$

[5 marks]

[5 markah]

CLO1  
C3

- (c) Sketch Argand's Diagram for the following complex number and express in polar, trigonometric and exponential forms.

*Lakarkan Gambarajah Argand bagi nombor kompleks yang diberi. Seterusnya ungkapkan dalam bentuk kutub, trigonometri dan eksponen.*

i.  $z = 4 + 9i$

[7 marks]

[7 markah]

ii.  $z = 4 - 8i$

[7 marks]

[7 markah]

**SECTION B : 75 MARKS*****BAHAGIAN B : 75 MARKAH*****INSTRUCTION:**

This section consists of **FOUR (4)** structured questions. Answer **THREE (3)** questions only.

**ARAHAN:**

*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **TIGA (3)** soalan sahaja.*

**QUESTION 2*****SOALAN 2***

- (a) Differentiate the following functions:

*Bezakan fungsi-fungsi berikut:*

CLO2  
C2

i.  $y = x^3 - 5x^{-2} + x - 3$

[2 marks]

[2 markah]

CLO2  
C2

ii.  $y = (4 - 3x^2)^5$

[3 marks]

[3 markah]

CLO2  
C3

- (b) Differentiate  $y = \cos(4x^2 + 1)$  by using the Chain Rule.

*Bezakan  $y = \cos(4x^2 + 1)$  menggunakan Petua Rantai.*

[5 marks]

[5 markah]

CLO2  
C3

- (c) Differentiate  $s = t^3 (5 + 6t^2)^4$

*Bezakan  $s = t^3 (5 + 6t^2)^4$*

[5 marks]

[5 markah]

CLO2  
C3

(d) Find  $\frac{dy}{dx}$  if given  $y = 4e^{(5t+3)}$  and  $x = 8 - 6t^3$ .

Cari  $\frac{dy}{dx}$  jika diberi  $y = 4e^{(5t+3)}$  dan  $x = 8 - 6t^3$ .

[5 marks]

[5 markah]

CLO2  
C3

(e) Find the second derivative for  $s = (4 - 3t)^3$  if  $t=1$ .

Cari terbitan kedua bagi  $s = (4 - 3t)^3$  jika  $t=1$ .

[5 marks]

[5 markah]

**QUESTION 3****SOALAN 3**

- (a) Particle P moves along a straight line and passes through a fixed point O. Its displacement,  $s$  m, is given by  $s = t^3 + 6t^2 - 36t + 15$ , where  $t$  is the time, in seconds, after passing through O.

*Suatu zarah P bergerak di sepanjang suatu garis lurus dan melalui satu titik tetap O. Sesarannya, s m, diberi oleh  $s = t^3 + 6t^2 - 36t + 15$ , dengan keadaan t ialah masa, dalam saat, selepas melalui O.*

Find

*Cari :*

CLO2  
C2

- i. the initial position of P, in m.  
*kedudukan awal P, dalam m.*

[2 marks]

[2 markah]

CLO2  
C2

- ii. the displacement of P from O when P is instantaneous at rest.  
*sesaran P dari O apabila P berada dalam keadaan rehat seketika.*

[3 marks]

[3 markah]

CLO2  
C2

- iii. the acceleration of P when its velocity,  $v = -21 \text{ m/s}$ .  
*pecutan P apabila halaju, v = -21 m/s.*

[4 marks]

[4 markah]

CLO2  
C2

- (b) The side of a square is increasing at a rate of 8 cm/s. Find the rate of increase of the square's area when the length of the side is 13 cm.

*Sisi sebuah segiempat sama bertambah pada kadar 8 cm/s. Cari pertambahan luas segiempat sama berkenaan apabila panjang sisinya ialah 13 cm.*

[4 marks]

[4 markah]

- (c) Given  $y = 2 + 24x + 3x^2 - x^3$  represents a curve line.

*Diberi persamaan  $y = 2 + 24x + 3x^2 - x^3$  mewakili satu garis lengkung.*

CLO2  
C3

- i. Determine the coordinates of the turning points of the curve line.

*Tentukan koordinat titik pusingan bagi garis lengkung tersebut.*

[5 marks]

[5 markah]

CLO2  
C3

- ii. Determine the nature of the turning points.

*Tentukan sifat titik pusingan tersebut.*

[4 marks]

[4 markah]

CLO2  
C3

- iii. Sketch the graph of the turning points.

*Lakarkan graf bagi titik pusingan tersebut.*

[3 marks]

[3 markah]

**QUESTION 4****SOALAN 4**CLO3  
C3

- (a) Solve the following integrals:

*Selesaikan pengamiran berikut:*

i.  $\int \frac{x^2}{3} + 3x + \frac{3}{x^4} dx$

[3 marks]

ii.  $\int (4s+7)(3-s) ds$

[3 markah]

iii.  $\int 6p(3p^2 + 2)^8 dp$

[3 marks]

[3 markah]

CLO3  
C3

- (b) Integrate each of the following:

*Kamirkan yang berikut:*

i.  $\int 4x^3 e^{x^4} dx$

[4 marks]

[4 markah]

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

[4 marks]

[4 markah]

CLO3  
C3

- (c) Evaluate the following:

*Nilaikan yang berikut:*

$$\int_{-1}^0 \frac{2x^3}{(x^4 - 1)^3} dx$$

[4 marks]

[4 markah]

[7 marks]

[7 markah]

**QUESTION 5****SOALAN 5**

- (a) Figure 1 shows the curve of  $y = x^2 + 3$  intersects the straight line of  $x + y = 5$  at point P.

*Rajah 1 menunjukkan lengkung  $y = x^2 + 3$  bersilang dengan garis lurus  $x + y = 5$  pada titik P.*

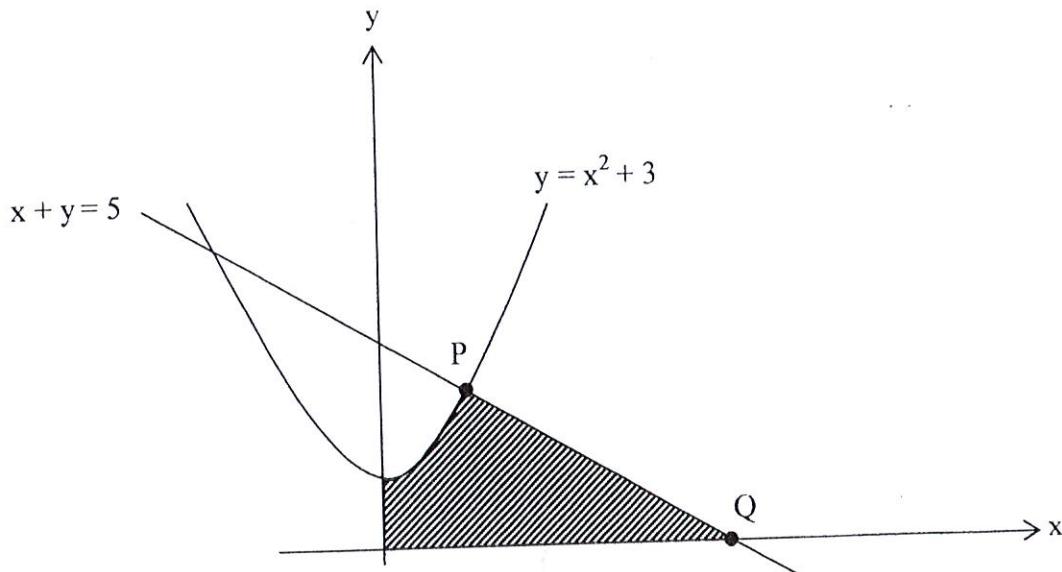


Figure 1

Find :

*Cari :*CLO3  
C2

- i. the coordinate of point P and Q.  
*koordinat titik P dan Q.*

[6 marks]

[6 markah]

CLO3  
C3

- ii. the area of shaded region.  
*luas kawasan berlorek.*

[6 marks]

[6 markah]

- (b) Figure 2 shows the graph of  $y = \frac{2}{x}$  between  $y = 1$  and  $y = 5$  is rotated completely around the y-axis.

Rajah 2 menunjukkan graf  $y = \frac{2}{x}$  di antara  $y = 1$  dan  $y = 5$  berputar sepenuhnya pada paksi y.

CLO3  
C3

- i. Calculate the volume generated when the shaded region is rotated  $360^\circ$  through y-axis.

Kirakan isipadu yang terjana apabila rantau berlorek diputar  $360^\circ$  melalui paksi y.

[4 marks]

[4 marks]

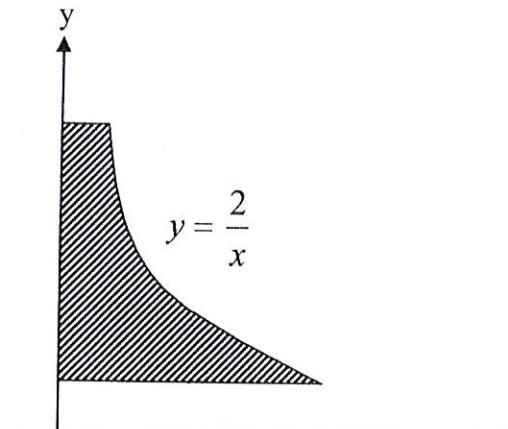


Figure 2

CLO3  
C1

- ii. Sketch the solid obtained when the shaded region is rotated  $360^\circ$  at y-axis.  
Lakarkan bentuk pepejal yang terhasil apabila rantau berlorek diputar  $360^\circ$  pada paksi y.

[1 mark]

[1 markah]

- (c) A particle moves along a straight line from fixed point O. Its acceleration,  $a = 15 - 6t$ , where  $t$  is the time, in seconds, after leaving the point O.

*Suatu zarah bergerak di sepanjang suatu garis lurus dari titik tetap O. Pecutannya,  $a = 15 - 6t$ , di mana t ialah masa, dalam saat, selepas meninggalkan titik O.*

Find :

Cari :

- CLO3  
C2
- i. the initial acceleration.  
*pecutan awal.*

[2 marks]

[2 markah]

- CLO3  
C2
- ii. the velocity of the particle when the acceleration is  $3 \text{ m/s}^2$ .  
*halaju zarah apabila pecutannya adalah  $3 \text{ m/s}^2$ .*

[4 marks]

[4 markah]

- CLO3  
C3
- iii. the total distance traveled by the particle after 5 seconds.  
*jumlah jarak yang dilalui oleh zarah selepas 5 saat.*

[2 marks]

[2 markah]

END OF QUESTION

SOALAN TAMAT

## FORMULA SHEET FOR BA201

COMPLEX NUMBER			
1.	$\text{Modulus of } z = \sqrt{a^2 + b^2}$	2.	$\text{Argument of } z = \tan^{-1} \left[ \frac{b}{a} \right]$
3.	$\text{Cartesian Form}$ $z = a + bi$	4.	$\text{Polar Form}$ $z = r\angle\theta$
5.	$\text{Trigonometric Form}$ $z = r[\cos\theta + i\sin\theta]$		$\text{Exponential Form}$ $z = re^{i\theta}$
BASICS OF DIFFERENTIATION			
1.	$\frac{d}{dx}(ax^n) = anx^{n-1}$	2.	$\frac{d}{dx}(ax + b)^n = n(ax + b)^{n-1} \times \frac{d}{dx}(ax + b)$
3.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du}$ [Chain Rule]	4.	$\frac{dy}{dx} = anu^{n-1} \times \frac{du}{dx}$ [Power Rule]
5.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$ [Quotient Rule]	6.	$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}$ [Product Rule]
7.	$\frac{d}{dx}(\ln x) = \frac{1}{x}$	8.	$\frac{d}{dx}[\ln(ax + b)] = \frac{1}{ax + b} \times \frac{d}{dx}(ax + b)$
9.	$\frac{d}{dx}(e^x) = e^x$	10.	$\frac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \frac{d}{dx}(ax + b)$
11.	$\frac{d}{dx}(\sin x) = \cos x$	12.	$\frac{d}{dx}(\cos x) = -\sin x$
13.	$\frac{d}{dx}(\tan x) = \sec^2 x$	14.	$\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx}$ [Parametric Equation]
14.	$\frac{d}{dx}[\sin(ax + b)] = \cos(ax + b) \times \frac{d}{dx}(ax + b)$		
15.	$\frac{d}{dx}[\cos(ax + b)] = -\sin(ax + b) \times \frac{d}{dx}(ax + b)$		
16.	$\frac{d}{dx}[\tan(ax + b)] = \sec^2(ax + b) \times \frac{d}{dx}(ax + b)$		
17.	$\frac{d}{dx}[\sin^n u] = n \sin^{n-1} u \times \cos u \times \frac{du}{dx}$		

18.  $\frac{d}{dx} [\cos^n u] = n \cos^{n-1} u \times -\sin u \times \frac{du}{dx}$

19.  $\frac{d}{dx} [\tan^n u] = n \tan^{n-1} u \times \sec^2 u \times \frac{du}{dx}$

### BASIC OF INTEGRATION

1.  $\int ax^n dx = \frac{ax^{n+1}}{n+1} + c ; \{n \neq -1\}$

2.  $\int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{(a)(n+1)} + c ; \{n \neq -1\}$

3.  $\int \frac{1}{x} dx = \ln x + c$

4.  $\int \frac{1}{ax+b} dx = \frac{1}{a} \times \ln(ax+b) + c$

5.  $\int e^x dx = e^x + c$

6.  $\int e^{ax+b} dx = \frac{1}{a} \times e^{ax+b} + c$

7.  $\int k dx = kx + c ; k \text{ is a constant}$

8.  $\int \sin x dx = -\cos x + c$

9.  $\int \cos x dx = \sin x + c$

10.  $\int \sec^2 x dx = \tan x + c$

11.  $\int \sin(ax+b) dx = -\frac{1}{a} \times \cos(ax+b) + c$

12.  $\int \cos(ax+b) dx = \frac{1}{a} \times \sin(ax+b) + c$

13.  $\int \sec^2(ax+b) dx = \frac{1}{a} \times \tan(ax+b) + c$

14.  $\int_a^b f(x) dx = [F(x)]_a^b = F(b) - F(a)$

### Identity Trigonometry

1.  $\cos^2 \theta + \sin^2 \theta = 1$

$$\begin{aligned}\cos 2\theta &= 2\cos^2 \theta - 1 \\ &= 1 - 2\sin^2 \theta \\ &= \cos^2 \theta - \sin^2 \theta\end{aligned}$$

3.  $\sin 2\theta = 2\sin \theta \cos \theta$

4.  $\sec^2 \theta = 1 + \tan^2 \theta$

5.  $\tan 2\theta = \frac{2\tan \theta}{1 - \tan^2 \theta}$

6.  $\operatorname{cosec}^2 \theta = 1 + \cot^2 \theta$

7.  $a\sin \theta + b\cos \theta = R\sin(\theta + \alpha)$

8.  $a\sin \theta - b\cos \theta = R\sin(\theta - \alpha)$

9.  $a\cos \theta + b\sin \theta = R\cos(\theta - \alpha)$

10.  $a\cos \theta - b\sin \theta = R\cos(\theta + \alpha)$

**AREA UNDER CURVE**

1.  $A_x = \int_a^b y \, dx$

2.  $A_y = \int_a^b x \, dy$

**VOLUME UNDER CURVE**

1.  $V_x = \pi \int_a^b y^2 \, dx$

2.  $V_y = \pi \int_a^b x^2 \, dy$

**QUADRATIC FORMULA**

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

