

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR
SESI JUN 2015

BA201: ENGINEERING MATHEMATICS

TARIKH : 28 OKTOBER 2015
MASA : 2.30 PM – 4.30 PM (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.

Bahagian A: Struktur (1 soalan)

Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

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 questions.

ARAHAN :

Bahagian ini mengandungi SATU (1) soalan wajib berstruktur.

QUESTION 1**SOALAN 1**

CLO1
C1

- (a) Express the followings in the form of $x + yi$.

Ungkapkan bentuk di bawah kepada bentuk $x + yi$.

i. $i^4 + i^9 + 2i^{16}$ [2 marks]

[2 markah]

ii. $(2 - 5i)(3 - 5i)$ [3 marks]

[3 markah]

CLO1
C2

- (b) Given the complex numbers, $u = 5 + 4i$ and $v = -2 - 3i$.

Diberi nombor kompleks, $u = 5 + 4i$ dan $v = -2 - 3i$.

i. Find $u - v$ and $2u + v$ [4 marks]

Dapatkan $u - v$ dan $2u + v$ [4 markah]

ii. Sketch the Argand's Diagram then calculate the modulus and argument for u and v . [6 marks]

Lakarkan gambarajah Argand dan seterusnya dapatkan modulus dan hujah bagi u dan v .

[6 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

CLO2

C3

- (a) Differentiate the following functions:

Bezakan persamaan dibawah :

i. $y = (x^2 + 3)(3 - x^3)$

[3 marks]

[3 markah]

ii. $y = \frac{1}{(2x^2 - 10)^4}$

[4 marks]

[4 markah]

iii. $y = \sin x^3$

[5 marks]

[5 markah]

CLO2
C3

- (b) Find $\frac{dy}{dx}$ for the parametric equation $y = 2t^3$ and $x = 4t - t^2$.

[4 marks]

Dapatkan $\frac{dy}{dx}$ bagi persamaan parametric $y = 2t^3$ dan $x = 4t - t^2$.

[4 markah]

- (c) Let $y = e^x (1 + e^{2x})^2$. Find $\frac{dy}{dx}$ by using Product Rule.

[5 marks]

Diberi $y = e^x (1 + e^{2x})^2$. Dapatkan $\frac{dy}{dx}$ dengan menggunakan Petua Hasil Darab.

[5 markah]

- (d) Given $y = \frac{1}{2}x + x^3 - 2x^{-5}$, find the value of $\frac{dy}{dx}$ if $x = 5$.

[4 marks]

Diberi $y = \frac{1}{2}x + x^3 - 2x^{-5}$, dapatkan nilai bagi $\frac{dy}{dx}$ apabila $x = 5$.

[4 markah]

CLO1
C2

- (c) Express
- $z = -1 + 2i$
- in the Trigonometric and Polar forms. [6 marks]

Ungkapkan $z = -1 + 2i$ kepada bentuk Trigonometri dan Kutub. [6 markah]

CLO1
C2

- (d) Determine the values of
- a
- and
- b
- for the following equation

$$(a + ib)(1 - 4i) = 2 + 3i \quad [4 \text{ marks}]$$

Tentukan nilai a dan b bagi persamaan berikut [4 markah]

$$(a + ib)(1 - 4i) = 2 + 3i$$

SOALAN 3

CLO2
C3

- (a) Find the coordinates of the stationary points of $y = 4x^3 + 3x^2 - 5$ and determine their nature.

Dapatkan koordinat titik-titik pegun bagi $y = 4x^3 + 3x^2 - 5$ dan tentukan sifat titik pegun tersebut.

[11 marks]

[11 markah]

CLO2
C3

- (b) A lorry is moving in a straight line according to $s = \frac{1}{4}t^4 - 8t$, with its displacement, s in meter and the time, t in seconds. Find the:

Sebuah lori bergerak dalam satu garis lurus dengan keadaan $s = \frac{1}{4}t^4 - 8t$, dimana sesarannya, s meter dan masa, t dalam saat. Dapatkan:

- i. displacement, s for the lorry after 3 seconds.
sesaran, s lori tersebut selepas 3 saat.

[2 marks]

[2 markah]

- ii. distance travelled by the lorry in the fourth second.
jarak, s lori tersebut dalam saat ke 4.

[4 marks]

[4 markah]

- iii. velocity, v of the lorry when the acceleration, $a = 10 \text{ m/s}^2$.
halaju, v bagi lori tersebut apabila pecutan, $a = 10 \text{ m/s}^2$.

[6 marks]

[6 markah]

- iv. acceleration of the lorry at the time $t = 2$ seconds.
pecutan lori tersebut pada masa $t = 2$ saat.

[2 marks]

[2 markah]

QUESTION 4**SOALAN 4**

- (a) Complete the following integrals :

Lengkapkan kamiran berikut :

CLO3
C3 i. $\int (3x^2 + 4)(x - 4) dx$ [3 marks]

[3 markah]

CLO3
C3 ii. $\int \left(\frac{3}{3x-1} \right) dx$ [2 marks]

[2 markah]

CLO3
C3 iii. $\int x^2 (2x^3 + 3)^5 dx$ [5 marks]

[5 markah]

CLO3
C3 iv. $\int e^x (e^x + 3)^3 dx$ [5 marks]

[5 markah]

CLO3
C3 (b) Given $\int_1^2 g(x) dx = 3$. Calculate the value of $\int_1^2 [3x + g(x)] dx$ [4 marks]

[4 markah]

Diberi bahawa $\int_1^2 g(x) dx = 3$. Cari nilai bagi $\int_1^2 [3x + g(x)] dx$ [4 Markah]

CLO3
C3 (c) Evaluate $\int_2^3 \frac{3x^2 - 1}{x^3 - x} dx$ [6 marks]

[6 markah]

Nilaikan $\int_2^3 \frac{3x^2 - 1}{x^3 - x} dx$ [6 markah]

SOALAN 5

CLO 3

C3

- (a) Determine the area of the region bounded by the curve $y = 2 - \frac{x^2}{2}$ and x-axis, between the range $x = 0$ and $x = 3$.

Dapatkan luas kawasan yang dibatasi oleh lengkuk $y = 2 - \frac{x^2}{2}$ dan paksi-x, julat di antara $x = 0$ dan $x = 3$.

[6 marks]

[6 markah]

CLO 3

- (b) Find the volume of revolution in terms of π , when the region bounded by the curve $y = \sqrt{4 - x^2}$, the x-axis for $0 \leq x \leq 3$ is rotated 360° at the x-axis.

C3

Dapatkan isipadu bongkah yang terhasil dalam sebutan π , apabila rantau yang dibatasi oleh lengkung $y = \sqrt{4 - x^2}$ diputarkan 360° pada paksi x iaitu $0 \leq x \leq 3$.

[6 marks]

[6 markah]

- (c) A particle passes through a fixed point O along a straight line with velocity of 8 ms^{-1} . Its acceleration, $a \text{ ms}^{-2}$, t seconds after passing through O is given by $a = 4(t - 2)$. Find :

Suatu zarah bergerak dari satu titik tetap O pada satu garis lurus dengan halaju adalah 8 ms^{-1} . Pecutannya, $a \text{ ms}^{-2}$ apabila melalui titik O diberi dalam t saat ialah $a = 4(t - 2)$. Dapatkan :

CLO 3

C3

- i. the values of t when the particle is momentarily at rest.

[4 marks]

nilai t apabila zarah dalam keadaan rehat.

[4 markah]

CLO 3

C3

- ii. the distance travelled in the fourth second.

[4 marks]

jarak yang dilalui dalam saat ke empat.

[4 markah]

CLO 3

iii. the displacement when the particle attains it's minimum velocity.

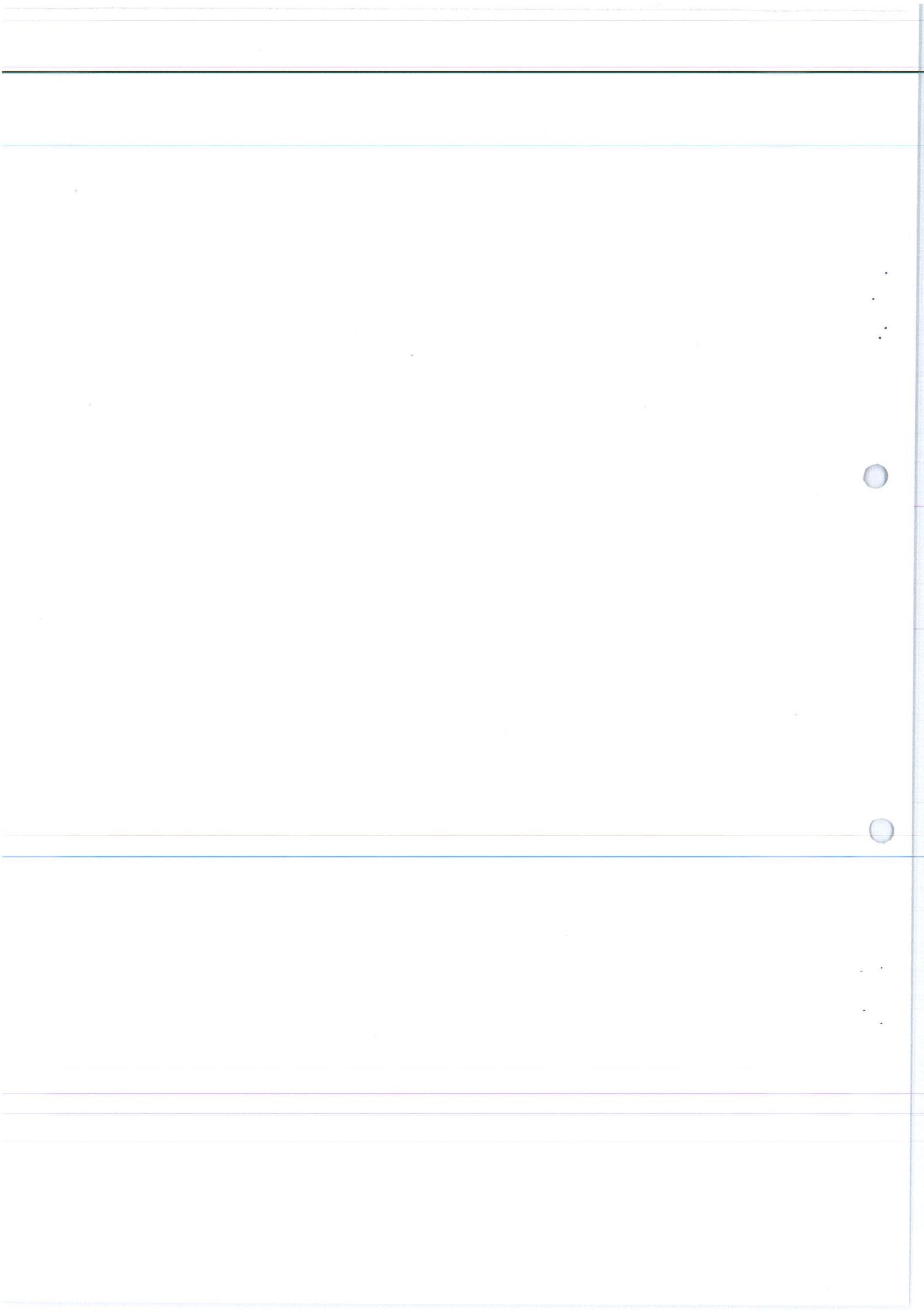
[5 marks]

C3

sesaran apabila halaju zarah minimum.

[5 markah]

SOALAN TAMAT



FORMULA SHEET FOR BA201

COMPLEX NUMBER			
1.	<i>Modulus of z</i> = $\sqrt{a^2 + b^2}$	2.	<i>Argument of z</i> = $\tan^{-1} \left[\frac{b}{a} \right]$
3.	<i>Cartesian Form</i> $z = a + bi$	4.	<i>Polar Form</i> $z = r\angle\theta$
5.	<i>Trigonometric Form</i> $z = r[\cos\theta + i\sin\theta]$		<i>Exponential Form</i> $z = re^{i\theta}$
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.	$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}$ [Product Rule]
5.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$ [Quotient Rule]	6.	$\frac{d}{dx}[\ln(ax + b)] = \frac{1}{ax + b} \times \frac{d}{dx}(ax + b)$
7.	$\frac{d}{dx}(\ln x) = \frac{1}{x}$	8.	$\frac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \frac{d}{dx}(ax + b)$
9.	$\frac{d}{dx}(e^x) = e^x$	10.	$\frac{d}{dx}(\cos x) = -\sin x$
11.	$\frac{d}{dx}(\sin x) = \cos x$	12.	$\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx}$ [Parametric Equation]
13.	$\frac{d}{dx}(\tan x) = \sec^2 x$		
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.	$\cos^2 \theta + \sin^2 \theta = 1$	2.	$\begin{aligned} \cos 2\theta &= 2 \cos^2 \theta - 1 \\ &= 1 - 2 \sin^2 \theta \\ &= \cos^2 \theta - \sin^2 \theta \end{aligned}$
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

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

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

VOLUME UNDER CURVE

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

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

QUADRATIC FORMULA

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

