

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR
SESI DISEMBER 2015

DBM2013 : ENGINEERING MATHEMATICS 2

TARIKH : 06 APRIL 2016
MASA : 8.30AM - 10.30AM (2 JAM)

Kertas ini mengandungi SEMBILAN (9) halaman bercetak.

Bahagian A: Struktur (1 soalan)

Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan : Kertas Graf, Formula dsb / Tiada

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
C1

- (a) Simplify each of the following :
Permudahkan setiap yang berikut :

i. $2^{2x} \times 4^{2x}$ [3 marks]
[3 markah]

ii. $2 \log_2 3 + \log_2 xy - 3 \log_2 y$ [3 marks]
[3 markah]

CLO1
C2

- (b) Solve the following equations :
Selesaikan persamaan berikut :

i. $2 \times 2^{x+1} = 8$ [4 marks]
[4 markah]

ii. $\log_2 3 + \log_2 (x-1) = 4$ [5 marks]
[5 markah]

iii. $\log(4x-1) - \log 3 = \log(x+2)$ [5 marks]
[5 markah]

CLO1
C3

- (c) Solve the equation $3^{2x} \cdot 9^{(x-1)} = 27$
Selesaikan persamaan $3^{2x} \cdot 9^{(x-1)} = 27$

[5 marks]
[5 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 (a) Differentiate the following functions.

Bezakan fungsi-fungsi berikut.

i. $y = (3x^2 + 5)(x + 7)$

[4 marks]
[4 markah]

ii. $y = \frac{e^{5x}}{4x + 7}$

[4 marks]
[4 markah]

(b)

- CLO2 C3 i. Determine the second order differentiation for the function $y = \cos^3 3x$

Tentukan pembezaan peringkat kedua bagi fungsi $y = \cos^3 3x$

[7 marks]
[7 markah]

- ii. Find the coordinates of the stationary points of the curve

$y = x^3 - 6x^2 + 9x + 5$. Determine their nature and sketch the graph of the curve.

Cari koordinat titik pegun bagi lengkung $y = x^3 - 6x^2 + 9x + 5$

Tentukan sifat bagi titik pegun dan lakarkan graf lengkung tersebut.

[10 marks]
[10 markah]

QUESTION 3

SOALAN 3

CLO2
C2

(a)

- i. The parametric equation of a function is given as $y = 3 \cos 2t$, $x = 2 \sin t$.

Determine the expressions for $\frac{dy}{dx}$.

Fungsi persamaan parametik diberi sebagai $y = 3 \cos 2t$, $x = 2 \sin t$. Tentukan

ungkapan $\frac{dy}{dx}$.

[4 marks]

[4 markah]

- ii. Find $\frac{dy}{dx}$ for equation $x^3 + 3x^2y - y^2 = 7$ by using the Implicit Differentiation.

Cari $\frac{dy}{dx}$ bagi persamaan $x^3 + 3x^2y - y^2 = 7$ menggunakan Pembezaan Tersirat.

[4 marks]

[4 markah]

CLO2
C3

(b)

- i. Given $z = 5x^3 + 3x^2y^4 - 2y^2$, find $\frac{\partial z}{\partial x}$, $\frac{\partial z}{\partial y}$, $\frac{\partial^2 z}{\partial x^2}$ and $\frac{\partial^2 z}{\partial y^2}$.

Diberi $z = 5x^3 + 3x^2y^4 - 2y^2$, cari $\frac{\partial z}{\partial x}$, $\frac{\partial z}{\partial y}$, $\frac{\partial^2 z}{\partial x^2}$ dan $\frac{\partial^2 z}{\partial y^2}$.

[8 marks]

[8 markah]

- ii. A spherical balloon is inflated at a rate of $3 \text{ cm}^3/\text{s}$. Find the increment rate of the radius when the radius is 2 cm and 4 cm .

Sebiji belon dipamkan pada kadar $3\text{cm}^3/\text{s}$. Cari kadar perubahan jejari apabila jejarinya ialah 2cm dan 4cm .

[9 marks]

[9 markah]

QUESTION 4***SOALAN 4***

CLO2
C2

- a) Solve the following integral

Selesaikan pengamiran yang berikut:

i. $\int 3x^6 - 2x^2 + 7x + 5 \, dx$ [4 marks]

[4 markah]

ii. $\int e^{-x} \, dx$ [2 marks]

[2 markah]

CLO2
C3

- b) Integrate the following by using the substitution method:

Kamirkan yang berikut dengan menggunakan kaedah penggantian:

i. $\int x^2(1+2x^3)^5 \, dx$ [6 marks]

[6 markah]

ii. $\int \sin x \cos^3 x \, dx$ [6 marks]

[6 markah]

iii. $\int e^x(e^x - 1)^2 \, dx$ [7 marks]

[7 markah]

SULIT

QUESTION 5

SOALAN 5

CLO2
C2

- (a) Diagram 5(a) shows a region which is enclosed by a curve $y = x^2$ and a line $y = -2x + 3$ meets at point A. The line $y = -2x + 3$ meets the x-axis at B. Find the value of the volume that is obtained when the shaded region is rotated 360° at x-axis.

Gambarajah 5(a) memunjukkan kawasan yang ditutup oleh lengkung $y = x^2$ dan garis lurus $y = -2x + 3$ bertemu di titik A. Garis $y = -2x + 3$ bertemu paksi x pada B. Dapatkan nilai isipadu yang diperolehi apabila kawasan berlorek diputarkan 360° pada paksi-x.

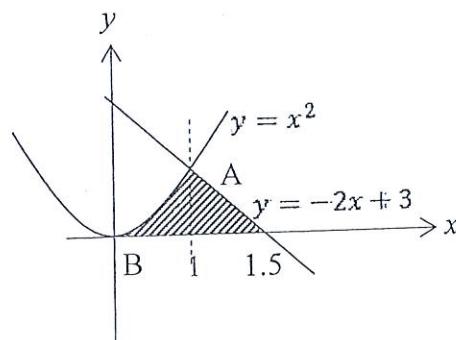


Diagram 5(a) / Rajah 5(a)

[8 marks]
[8 markah]CLO2
C3

- (b) Integrate the following function of integrals by using the suitable method:

Kamirkan persamaan kamiran berikut menggunakan kaedah yang sesuai:

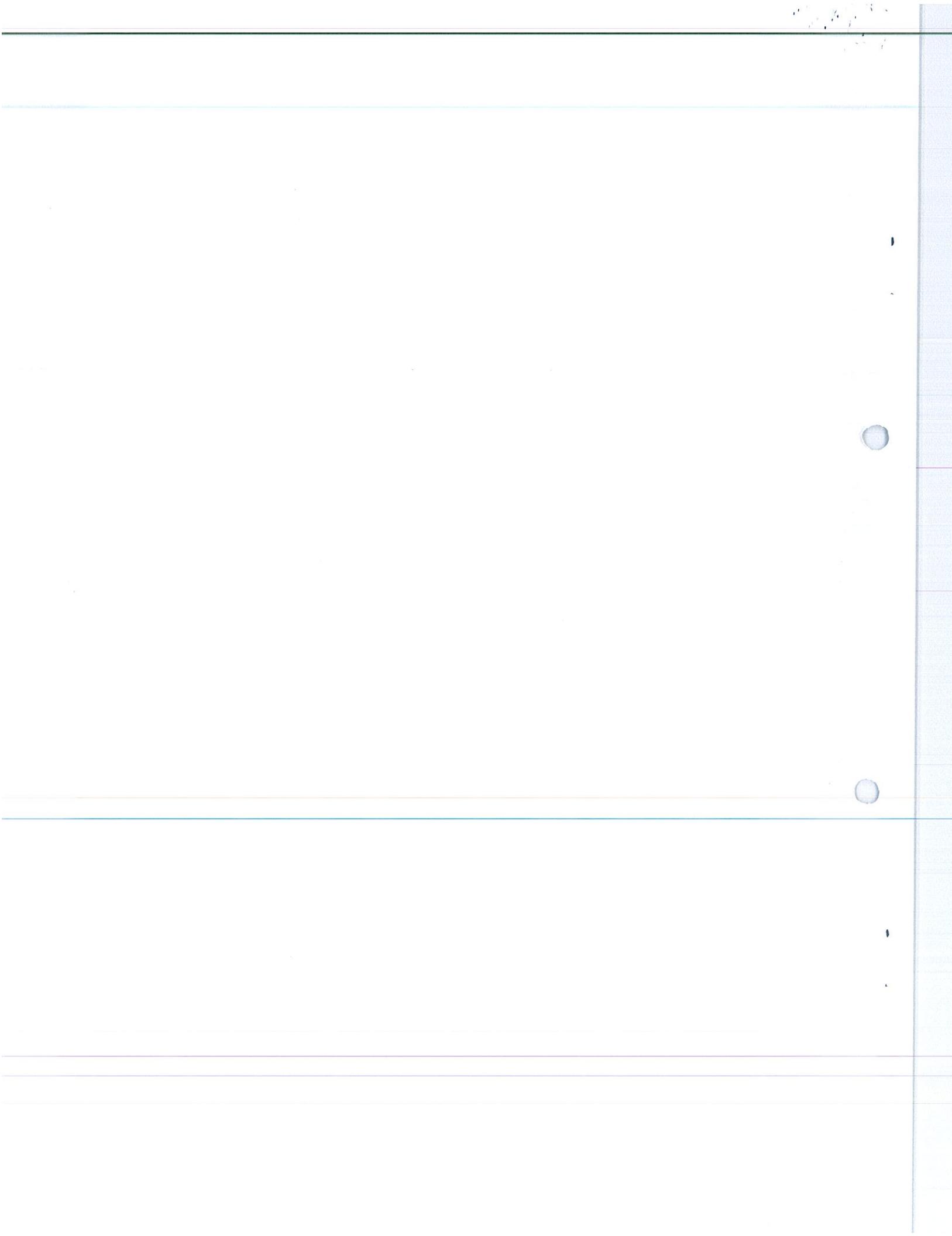
i) $\int 3x^3 \sin x dx$

[8 marks]
[8 markah]

ii) $\int \frac{10x+15}{x^2+3x-10} dx$

[9 marks]
[9 markah]

SOALAN TAMAT



FORMULA SHEET FOR DBM2013

EXPONENTS AND LOGARITHMS			
LAW OF EXPONENTS		LAW OF LOGARITHMS	
1.	$a^m \times a^n = a^{m+n}$	8.	$\log_a a = 1$
2.	$\frac{a^m}{a^n} = a^{m-n}$	9.	$\log_a 1 = 0$
3.	$(a^m)^n = a^{m \times n}$	10.	$\log_a b = \frac{\log_c b}{\log_c a}$
4.	$a^0 = 1$	11.	$\log_a MN = \log_a M + \log_a N$
5.	$a^{-n} = \frac{1}{a^n}, a \neq 0$	12.	$\log_a \frac{M}{N} = \log_a M - \log_a N$
6.	$a^{\frac{m}{n}} = (\sqrt[n]{a})^m$	13.	$\log_a N^P = P \log_a N$
7.	$(ab)^n = a^n b^n$	14.	$N = a^x \Leftrightarrow \log_a N = x$
DIFFERENTIATION			
1.	$\frac{d}{dx}(k) = 0, k \text{ is constant}$	2.	$\frac{d}{dx}(x^n) = nx^{n-1}$ [Power Rule]
3.	$\frac{d}{dx}(ax^n) = anx^{n-1}$	4.	$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$
5.	$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}$ [Product Rule]	6.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$ [Quotient Rule]
7.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du}$ [Chain Rule]	8.	$\frac{d}{dx}(e^x) = e^x$
9.	$\frac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \frac{d}{dx}(ax+b)$	10.	$\frac{d}{dx}(\ln x) = \frac{1}{x}$
11.	$\frac{d}{dx}[\ln(ax+b)] = \frac{1}{ax+b} \times \frac{d}{dx}(ax+b)$	12.	$\frac{d}{dx}(\sin x) = \cos x$
13.	$\frac{d}{dx}(\cos x) = -\sin x$	14.	$\frac{d}{dx}(\tan x) = \sec^2 x$

15.	$\frac{d}{dx} [\sin(ax + b)] = \cos(ax + b) \times \frac{d}{dx}(ax + b)$
16.	$\frac{d}{dx} [\cos(ax + b)] = -\sin(ax + b) \times \frac{d}{dx}(ax + b)$
17.	$\frac{d}{dx} [\tan(ax + b)] = \sec^2(ax + b) \times \frac{d}{dx}(ax + b)$
18.	$\frac{d}{dx} [\sin^n u] = n \sin^{n-1} u \times \cos u \times \frac{du}{dx}$
19.	$\frac{d}{dx} [\cos^n u] = n \cos^{n-1} u \times -\sin u \times \frac{du}{dx}$
20.	$\frac{d}{dx} [\tan^n u] = n \tan^{n-1} u \times \sec^2 u \times \frac{du}{dx}$
21.	$\frac{d}{dx} (\sin^{-1} u) = \frac{1}{\sqrt{1-u^2}} \frac{du}{dx}$
22.	$\frac{d}{dx} (\cos^{-1} u) = \frac{-1}{\sqrt{1-u^2}} \frac{du}{dx}$
23.	$\frac{d}{dx} (\tan^{-1} u) = \frac{1}{1+u^2} \frac{du}{dx}$
24.	$\frac{d}{dx} (\cot^{-1} u) = \frac{-1}{1+u^2} \frac{du}{dx}$
25.	$\frac{d}{dx} (\sec^{-1} u) = \frac{1}{ u \sqrt{u^2-1}} \frac{du}{dx}$
26.	$\frac{d}{dx} (\operatorname{cosec}^{-1} u) = \frac{-1}{ u \sqrt{u^2-1}} \frac{du}{dx}$
27.	$\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx}$ [Parametric Equation]

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.	$\int k dx = kx + c, k \text{ is constant}$	4.	$\int_a^b f(x) dx = F(b) - F(a)$
5.	$\int \frac{1}{x} dx = \ln x + c$	6.	$\int \frac{1}{ax+b} dx = \frac{1}{a} \times \ln(ax+b) + c$
7.	$\int e^x dx = e^x + c$	8.	$\int e^{ax+b} dx = \frac{1}{a} \times e^{ax+b} + c$
9.	$\int \sin x dx = -\cos x + c$	10.	$\int \cos x dx = \sin x + c$
11.	$\int \sec^2 x dx = \tan x + c$		
12.	$\int \sin(ax+b) dx = -\frac{1}{\frac{d}{dx}(ax+b)} \times \cos(ax+b) + c$		
13.	$\int \cos(ax+b) dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \sin(ax+b) + c$		

14.	$\int \sec^2(ax + b) dx = \frac{1}{\frac{d}{dx}(ax + b)} \times \tan(ax + b) + c$
15.	$\int \frac{1}{\sqrt{a^2 - u^2}} du = \sin^{-1} \frac{u}{a} + c$
16.	$\int \frac{-1}{\sqrt{a^2 - u^2}} du = \cos^{-1} \frac{u}{a} + c$
17.	$\int \frac{1}{a^2 + u^2} du = \frac{1}{a} \tan^{-1} \frac{u}{a} + c$
18.	$\int \frac{-1}{a^2 + u^2} du = \frac{1}{a} \cot^{-1} \frac{u}{a} + c$
19.	$\int \frac{1}{u\sqrt{u^2 - a^2}} du = \frac{1}{a} \sec^{-1} \frac{u}{a} + c$
20.	$\int \frac{-1}{u\sqrt{u^2 - a^2}} du = \frac{1}{a} \cosec^{-1} \frac{u}{a} + c$

Identity Trigonometry

1.	$\cos^2 \theta + \sin^2 \theta = 1$	2.	$1 + \tan^2 \theta = \sec^2 \theta$
3.	$1 + \cot^2 \theta = \cosec^2 \theta$	4.	$\sin 2\theta = 2 \sin \theta \cos \theta$
5.	$\cos 2\theta = 2 \cos^2 \theta - 1$ $= 1 - 2 \sin^2 \theta$ $= \cos^2 \theta - \sin^2 \theta$	6.	$\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$
7.	$\tan \theta = \frac{\sin \theta}{\cos \theta}$	8.	$\cot \theta = \frac{\cos \theta}{\sin \theta} = \frac{1}{\tan \theta}$
9.	$\sec \theta = \frac{1}{\cos \theta}$	10.	$\cosec \theta = \frac{1}{\sin \theta}$

AREA UNDER CURVE

1.	$A_x = \int_a^b y \, dx$	2.	$A_y = \int_a^b x \, dy$
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VOLUME UNDER CURVE

1.	$V_x = \pi \int_a^b y^2 \, dx$	2.	$V_y = \pi \int_a^b x^2 \, dy$
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INTEGRATION BY PARTS

$$\int u \, dv = uv - \int v \, du$$

