

SULIT



**KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI**

**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN MATEMATIK, SAINS DAN KOMPUTER

**PEPERIKSAAN AKHIR
SEMESTER I : 2023/2024**

FB10023 : MATHEMATICS 1

**TARIKH : 18 DISEMBER 2023
MASA : 11.15 PAGI – 1.15 PETANG (2 JAM)**

Kertas ini mengandungi **TUJUH (7)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan berstruktur. Jawab SEMUA soalan.

QUESTION 1**SOALAN 1**

- CLO1 (a) Given that $R = (-\infty, 7)$, $S = [-4, 2]$ and $T = (-2, \infty)$. Represent R, S and T on a number line. Then, identify the solution set for $R \cap S$.

Diberi $R = (-\infty, 7)$, $S = [-4, 2]$ dan $T = (-2, \infty)$. Wakilkan R, S dan T kepada garisan nombor. Kemudian, kenalpasti set penyelesaian untuk $R \cap S$.

[4 marks]

[4 markah]

- CLO1 (b) Express the values of a and b for expression $a + bi = 4 + \sqrt{-36} + 4i^4$.

Nyatakan nilai a dan b untuk ungkapan $a + bi = 4 + \sqrt{-36} + 4i^4$.

[6 marks]

[6 markah]

- CLO2 (c) A function is defined by $f(x) = x^2 + 2x + 1$. Show graphical method to find out the domain and range.

Suatu fungsi ditakrifkan oleh $f(x) = x^2 + 2x + 1$. Tunjukkan kaedah grafik untuk mengetahui domain dan julat.

[7 marks]

[7 markah]

CLO2

(d) Given that $f(x) = \frac{ax+8}{4x-2}, x \neq \frac{1}{2}$ where a is a constant.

i) Calculate the value of a when $f(1) = 6$ and write $f(x)$.

ii) Determine $(f \circ g)(x)$ when $g(x) = x - 4$.

Diberi $f(x) = \frac{ax+8}{4x-2}, x \neq \frac{1}{2}$ di mana a ialah pemalar.

i) Kira nilai a apabila $f(1) = 6$ dan tuliskan $f(x)$.

ii) Tentukan $(f \circ g)(x)$ apabila $g(x) = x - 4$.

[8 marks]

[8 markah]

QUESTION 2

SOALAN 2

- CLO1 (a) Show the solution of inequalities $2x^2 + 4x > -4 - 2x$ in interval notation.

Tunjukkan penyelesaian untuk ketidaksamaan $2x^2 + 4x > -4 - 2x$ dalam tatatanda selang.

[4 marks]

[4 markah]

- CLO1 (b) Find the solution of equation $|x^2 + 2x - 4| = 4$.

Cari penyelesaian untuk persamaan $|x^2 + 2x - 4| = 4$.

[6 marks]

[6 markah]

- CLO2 (c) Given that $\sin \theta = -\frac{3}{5}$, where θ lies in the third quadrant. Calculate the exact value of $\cos \theta + 3 \tan \theta$.

Diberi $\sin \theta = -\frac{3}{5}$, di mana θ berada pada kuadran ketiga. Kira nilai bagi $\cos \theta + 3 \tan \theta$.

[5 marks]

[5 markah]

- CLO2 (d) Show that $6\sec^2 x - 13\tan x = 0$ can be simplified to $6\tan^2 x - 13\tan x + 6 = 0$. Hence, solve the values of x , where $0^\circ < x < 360^\circ$ that satisfy the equation $6\sec^2 x - 13\tan x = 0$.

Tunjukkan $6\sec^2 x - 13\tan x = 0$ boleh dipermudahkan menjadi $6\tan^2 x - 13\tan x + 6 = 0$. Kemudian, selesaikan nilai x di mana $0^\circ < x < 360^\circ$ yang memenuhi persamaan $6\sec^2 x - 13\tan x = 0$.

[10 marks]

[10 markah]

QUESTION 3

SOALAN 3

CLO1

- (a) A sequence is defined by the formula $\frac{3+(-1)^n}{3^n}$. Express the first three terms of the sequence.

Satu jujukan ditakrifkan oleh formula $\frac{3+(-1)^n}{3^n}$. Ungkapkan tiga sebutan pertama bagi jujukan tersebut.

[4 marks]

[4 markah]

CLO1

- (b) Find the first four terms for the following binomial expansions.

Cari empat sebutan pertama bagi pengembangan binomial berikut.

$$\frac{1}{(1-2x)^2}$$

[6 marks]

[6 markah]

CLO2

- (c) Given that $x+5$ is a factor of the polynomials $P(x) = x^4 - 18x^2 + px + q$, where p and q are constants. If $P(x)$ is divided by $x-3$, the remainder is 8, calculate the values of p and q .

Diberi bahawa $x+5$ ialah faktor polynomial $P(x) = x^4 - 18x^2 + px + q$, di mana p dan q adalah pemalar. Jika $P(x)$ dibahagi dengan $x-3$, bakinya ialah 8, kirakan nilai p dan q .

[6 marks]

[6 markah]

CLO2

- (c) Solve the following partial fraction:

Selesaikan pecahan separa di bawah:

$$\frac{4x^2 + 3x - 10}{(x+1)(x+2)(x-2)}$$

[9 marks]

[9 markah]

QUESTION 4

SOALAN 4

- CLO2 (a) Given that $A = \begin{bmatrix} 3 & 3 & -2 \\ 1 & 0 & 1 \\ -2 & 1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 6 & 1 \\ 0 & -1 \\ 2 & 2 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 3 & 2 \\ -1 & 2 & 0 \end{bmatrix}$. Determine

the matrix D such that $D = (BC)^T - A$.

Diberi $A = \begin{bmatrix} 3 & 3 & -2 \\ 1 & 0 & 1 \\ -2 & 1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 6 & 1 \\ 0 & -1 \\ 2 & 2 \end{bmatrix}$ dan $C = \begin{bmatrix} 2 & 3 & 2 \\ -1 & 2 & 0 \end{bmatrix}$. Tentukan matrik

D di mana $D = (BC)^T - A$.

[5 marks]

[5 markah]

- CLO2 (b) Solve the following system of linear equations by using the Cramer's Rule, where the determinant of matrix of the system is -1 .

Selesaikan sistem persamaan linear berikut dengan menggunakan Petua

Cramer, di mana penentu matriks bagi sistem ialah -1 .

$$x + 2y + 3z = 11$$

$$2x + 4y + 5z = 21$$

$$3x + 5y + 6z = 27$$

[10 marks]

[10 markah]

- CLO1 (c) Recognize the limits based on the graph of function f given in the **Figure 4(c)**.
*Kenal pasti had berdasarkan graf fungsi f yang diberikan dalam **Rajah 4(c)**.*

(i) $\lim_{x \rightarrow -4^-} f(x)$
had $f(x)$
 $\lim_{x \rightarrow -4^-} f(x)$

(ii) $\lim_{x \rightarrow 1^+} f(x)$
had $f(x)$
 $\lim_{x \rightarrow 1^+} f(x)$

(iii) $\lim_{x \rightarrow 1} f(x)$
had $f(x)$
 $\lim_{x \rightarrow 1} f(x)$

(iv) $\lim_{x \rightarrow -4} f(x)$
had $f(x)$
 $\lim_{x \rightarrow -4} f(x)$

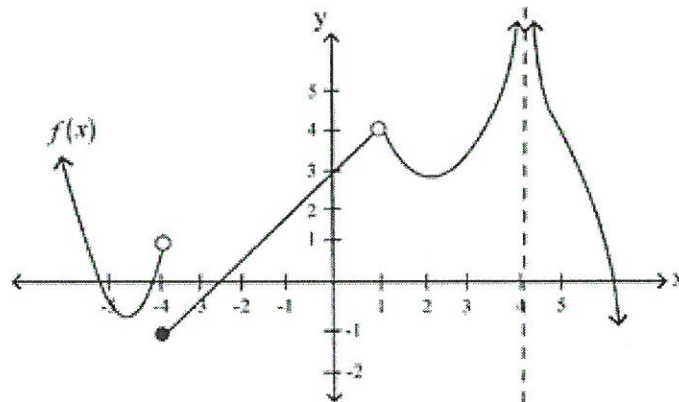


Figure 4(c) / *Rajah 4(c)*

[4 marks]

[4 markah]

- CLO1 (d) Express all vertical and horizontal asymptotes for the given function.
Tunjukkan semua asimptot menegak dan mendatar untuk fungsi yang diberikan.

$$f(x) = \frac{3x+4}{x-5}$$

[6 marks]

[6 markah]

SOALAN TAMAT

FORMULA FB10023 - MATHEMATICS 1

COMPLEX NUMBER	
1. Modulus of $z = \sqrt{a^2 + b^2}$	3. Polar form, $z = r(\cos \theta + i \sin \theta)$
2. Argument of $\tan \theta = \frac{b}{a}$	

EQUATIONS, INEQUALITIES AND ABSOLUTE VALUES	
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. $N = a^x \Leftrightarrow \log_a N = x$

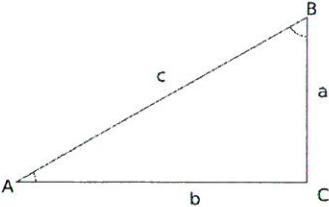
SEQUENCE AND SERIES	
ARITHMETIC SERIES	GEOMETRIC SERIES
1. $T_n = a + (n - 1)d$	3. $T_n = ar^{n-1}$
2. $S_n = \frac{n}{2}(a + l)$	4. $S_n = \frac{a(1-r^n)}{1-r}, r < 1$
3. $S_n = \frac{n}{2}[2a + (n-1)d]$	5. $S_n = \frac{a(r^n - 1)}{r - 1}, r > 1$
	6. $S_\infty = \frac{a}{1-r}$

BINOMIAL THEOREM	
7. $(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \binom{n}{3}a^{n-3}b^3 + \dots + \binom{n}{r}a^{n-r}b^r + b^n, n \in \mathbb{Z}^+$	
8. $(r+1)^{th}$ term, $T_{r+1} = \binom{n}{r}a^{n-r}b^r$	
9. $(1+ax)^n = 1 + n(ax) + \frac{n(n-1)}{2!}(ax)^2 + \frac{n(n-1)(n-2)}{3!}(ax)^3 + \dots, x < \frac{1}{ a }$	

MATRICES AND SYSTEM OF LINEAR EQUATIONS	
1. Cofactor, $C = (-1)^{i+j} M_{ij}$	3. Inverse of Matrix, $A^{-1} = \frac{1}{ A } Adj(A)$
2. Adjoin, $Adj(A) = C^T$	4. Cramer's Rule, $x = \frac{ A_1 }{ A }, \quad y = \frac{ A_2 }{ A }, \quad z = \frac{ A_3 }{ A },$

FUNCTIONS AND GRAPHS
1. $(g \circ f)(x) = g[f(x)]$
2. $(f \circ g)(x) = f[g(x)]$

POLYNOMIALS
1. $P(x) = D(x)Q(x) + R(x)$

TRIGONOMETRIC FUNCTIONS	
TRIGONOMETRIC RATIOS	
	1. $\sin \theta = \frac{a}{c}$
	2. $\cos \theta = \frac{b}{c}$
	3. $\tan \theta = \frac{a}{b}$
	4. $\tan \theta = \frac{\sin \theta}{\cos \theta}$
	5. $\operatorname{cosec} \theta = \frac{1}{\sin \theta}$
	6. $\sec \theta = \frac{1}{\cos \theta}$
	7. $\cot \theta = \frac{1}{\tan \theta}$
	8. $\sin(90^\circ - \theta) = \cos \theta$
	9. $\cos(90^\circ - \theta) = \sin \theta$
	10. $\tan(90^\circ - \theta) = \cot \theta$
TRIGONOMETRIC IDENTITIES	
9. $\cos^2 \theta + \sin^2 \theta = 1$	10. $\cot^2 \theta + 1 = \operatorname{cosec}^2 \theta$
11. $1 + \tan^2 \theta = \sec^2 \theta$	
COMPOUND ANGLE FORMULAE	
12. $\sin(A+B) = \sin A \cos B + \cos A \sin B$	13. $\cos(A-B) = \cos A \cos B + \sin A \sin B$
14. $\sin(A-B) = \sin A \cos B - \cos A \sin B$	15. $\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$
16. $\cos(A+B) = \cos A \cos B - \sin A \sin B$	17. $\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$

DOUBLE ANGLE FORMULAE	HALF ANGLE FORMULAE
18. $\sin 2A = 2 \sin A \cos A$	19. $\sin A = 2 \sin \frac{A}{2} \cos \frac{A}{2}$
20. $\cos 2A = 2 \cos^2 A - 1$ $= 1 - 2 \sin^2 A$ $= \cos^2 A - \sin^2 A$	21. $\cos A = \cos^2 \frac{A}{2} - \sin^2 \frac{A}{2}$ $= 2 \cos^2 \frac{A}{2} - 1$ $= 1 - 2 \sin^2 \frac{A}{2}$
22. $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$	23. $\tan A = \frac{2 \tan \frac{A}{2}}{1 - \tan^2 \frac{A}{2}}$
FACTOR FORMULAE	
24. $\sin x + \sin y = 2 \sin \left(\frac{x+y}{2} \right) \cos \left(\frac{x-y}{2} \right)$	
25. $\sin x - \sin y = 2 \cos \left(\frac{x+y}{2} \right) \sin \left(\frac{x-y}{2} \right)$	
26. $\cos x + \cos y = 2 \cos \left(\frac{x+y}{2} \right) \cos \left(\frac{x-y}{2} \right)$	
27. $\cos x - \cos y = -2 \sin \left(\frac{x+y}{2} \right) \sin \left(\frac{x-y}{2} \right)$	
28. $2 \sin A \cos B = \sin(A+B) + \sin(A-B)$	
29. $2 \cos A \cos B = \cos(A+B) + \cos(A-B)$	
30. $2 \cos A \sin B = \sin(A+B) - \sin(A-B)$	
31. $-2 \sin A \sin B = \cos(A+B) - \cos(A-B)$	
Expressions of $\sin x$, $\cos x$ and $\tan x$ in terms of t where $t = \tan \frac{x}{2}$	
32. $\tan x = \frac{2t}{1-t^2}$	33. $\sin x = \frac{2t}{1+t^2}$
34. $\cos x = \frac{1-t^2}{1+t^2}$	

LIMITS AND CONTINUITY	
1. $\lim_{x \rightarrow a} c = c$, where c is constant	5. $\lim_{x \rightarrow a} [f(x) - g(x)] = \lim_{x \rightarrow a} f(x) - \lim_{x \rightarrow a} g(x)$
2. $\lim_{x \rightarrow a} cf(x) = c \times \lim_{x \rightarrow a} f(x)$	6. $\lim_{x \rightarrow a} [f(x)g(x)] = \lim_{x \rightarrow a} f(x) \times \lim_{x \rightarrow a} g(x)$
3. $\lim_{x \rightarrow a} [f(x) + g(x)] = \lim_{x \rightarrow a} f(x) + \lim_{x \rightarrow a} g(x)$	7. $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \frac{\lim_{x \rightarrow a} f(x)}{\lim_{x \rightarrow a} g(x)}, \lim_{x \rightarrow a} g(x) \neq 0$
8. $\lim_{x \rightarrow a} [f(x)]^n = \left[\lim_{x \rightarrow a} f(x) \right]^n$	

