SAMPEL PERCUMA

Trial STPM 2017 Mathematics T Semester 1 Melaka

Set penuh: Kertas Percubaan STPM

Sem 1 · Mathematics T

Sampel ini: 6 muka surat. Set penuh ada:

- 3 fail PDF
- Semester 1: kertas percubaan (trial) negeri, subjek yang dipilih + skema
- Blueprint 30 hari Semester 1 (setiap subjek)
- Semester 3: percubaan 2024, 10 subjek, banyak negeri, soalan + skema dalam satu fail

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Sampel bermula di muka surat sebelah

2017-1-MEL-GBS

SECTION A (45 Marks) : Answer *all* questions in this section.

1. Solve each of the following inequalities:
   a) $2^x + 12(2^{-x}) - 7 < 0$ [3 marks]
   b) $log_{0.2}(x+4) < log_{0.2}(x^2-2)$ [5 marks]

2. Express $\frac{(1+x)^{\frac{1}{3}}}{(1-2x)^2}$ in ascending powers of x until the term in x^3. Find the values of x so that the expansion is valid. [6 marks]

3. a) A matrix P is given by

$$P = \begin{pmatrix} 3 & 5 & 6 \\ -2 & 1 & 2 \\ 1 & -3 & -4 \end{pmatrix}$$

Find the inverse of P using elementary row operations. [5 marks]

b) By applying the Gaussian elimination, solve the system of equations:

$$2x - 3y + z = -5$$
$$3x + 2y - z = 7$$
$$x + 4y - 5z = 3$$

[4 marks]

4. a) Given $z_1 = 1-2i$ and $z_2 = 3-i$, find the modulus and argument of $\frac{z_2}{z_1}$. Hence determine the real value of $(\frac{z_2}{z_1})^{20}$ [5 marks]

b) If $z = \cos\theta + i\sin\theta$, by using De Moivre's theorem,

find $z + \frac{1}{z}$ and $z^2 + \frac{1}{z^2}$ and show that $2\cos^2\theta = \cos 2\theta + 1$ [4 marks]

5. The equation of a conic is $2x^2 - 3y^2 + 8x + 18y - 43 = 0$
   a) Show that it is a hyperbola, and obtain the standard form of its equation. [3 marks]

   b) Find the foci, vertices and equations of the asymptotes of the hyperbola. [6 marks]

6. Find the angle between the straight line L_1 : $\frac{x+4}{1} = \frac{y-3}{-2} = \frac{z+6}{3}$ and L_2 : $\frac{x-2}{4} = \frac{y+5}{8} = \frac{z-9}{-5}$ [4 marks]

SECTION B (15 Marks) : Answer any *one* question in this section.

7. The polynomial $p(x) = hx^4 + kx^2 + 2x - 2$, where h and k are constants, has a factor $x - 1$, and leaves a remainder of -10 when divided by $x - 2$.

a) Determine the values of h and k. [3 marks]

b) Factorise $p(x)$ completely. [4 marks]

c) State the quadratic factor of $p(x)$. [2 marks]

(i) Deduce that the quadratic factor $p(x)$ is always negative for all real values of x.
[1 mark]

(ii) State the maximum value of the quadratic factor of $p(x)$ and its corresponding value of x.
[2 marks]

d) Determine the set of values of x for which $p(x) > (x-1)^2(6x-1)$.
[3 marks]

8. The points *A*, *B* and *C* have position vectors ***a***, ***b*** and ***c*** respectively, relative to an origin *O*, where ***a*** = 3***i*** + 4***j*** + 5***k***, ***b*** = 4***i*** + 6***j*** + 7***k*** and ***c*** = ***i*** + 5***j*** + 3***k***.

(a) Find (***b*** – ***a***) ×(***c*** – ***a***). [3 marks]

(b) Hence, or otherwise, find the area of ∆*ABC* and the volume of tetrahedron *OABC*.
[4 marks]

(c) Find an equation of the plane ∆*ABC* in the form ***r*** • ***n*** = ***p***. [2 marks]

(d) Given that the point *D* has position vector (2***i*** + ***j*** + 2***k***),

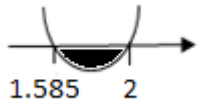
(i) Prove that the point of intersection, *E*, of $\overrightarrow{OD}$ with the plane *ABC* is $(\frac{1}{2}, \frac{1}{4}, \frac{1}{2})$.
[3 marks]

(ii) Find the acute angle between $\overrightarrow{ED}$ and the plane *ABC*. [3 marks]

2017-1-MELK-GBS-A

1a) $(2^x - 4)(2^x - 3) < 0$ or

$$let\ y = 2^x, \qquad (y-4)(y-3) < 0$$



..... M1

$1.585 < x < 2$ A1

[3m]

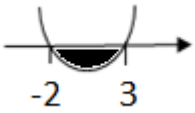
1b) $log_{0.2}\left[\frac{x^2-2}{x+4}\right] > log_{0.2}1$ M1

$\frac{x^2-2}{x+4} < 1$or $x + 4 > x^2 - 2$

..... M1

$$x^2 - x - 6 < 0$$

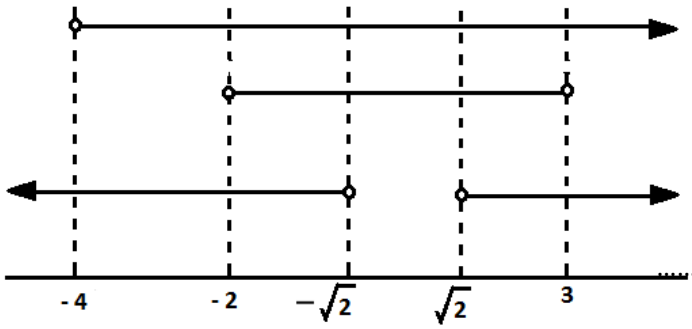
$$(x-3)(x+2) < 0$$



$$-2 < x < 3$$

$x + 4 > 0$, $\quad x^2 - 2 > 0$ } Either M1

$x > -4$ $\quad x > \sqrt{2}$ or $x < -\sqrt{2}$ } A1



..... M1

$\{x: -2 < x < -\sqrt{2}\ or\ \sqrt{2} < x < 3\}$ A1

[5m]

2) $\left(1+\frac{1}{x}\right)^{\frac{1}{3}} = 1+\frac{1}{3}x+\frac{\frac{1}{3}(\frac{1}{3}-1)}{1.2}x^2+\frac{\frac{1}{3}(\frac{1}{3}-1)(\frac{1}{3}-2)}{1.2.3}x^3+\cdots$

$= 1+\frac{1}{3}x-\frac{1}{9}x^2+\frac{5}{81}x^3+\cdots$ ..... either M1

$(1-2x)^{-2} = 1+4x+\frac{(-2)(-3)}{1.2}(-2x)^2+\frac{(-2)(-3)(-4)}{1.2.3}(-2x)^3+\cdots$

$= 1+4x+12x^2+32x^3+\cdots$ ..... Both A1 (answer)

$\frac{(1+\frac{1}{x})^{\frac{1}{3}}}{(1-2x)^2} = \left(1+\frac{1}{3}x-\frac{1}{9}x^2+\frac{5}{81}x^3+\cdots\right)(1+4x+12x^2+32x^3+\cdots)$ M1

$= 1+\frac{13}{3}x+\frac{119}{9}x^2+\frac{2885}{81}x^3+\cdots$ ..... M1 ..... A1

$|x|<1 \quad and \quad |2x|<1$

$\left\{x: -\frac{1}{2}<x<\frac{1}{2}\right\}$ A1

[6m]

4. $\frac{z_2}{z_1} = \frac{3-i}{1-2i} \cdot \frac{1+2i}{1+2i}$ M1

$= 1 + i$

$|\frac{z_2}{z_1}| = \sqrt{2}$ $arg\left(\frac{z_2}{z_1}\right) = \frac{\pi}{4}$ A1A1

$(\frac{z_2}{z_1})^{20} = (\sqrt{2})^{20}(\cos\frac{\pi}{4} + isin\frac{\pi}{4})^{20}$ M1

$= 2^{10}(cos5\pi + isin5\pi)$

Real value = -1024 A1

$Z + \frac{1}{Z} = 2cos\theta$ A1

$Z^2 + \frac{1}{Z^2} = 2cos2\theta$ A1

$\left(Z + \frac{1}{Z}\right)^2 = Z^2 + 2 + \frac{1}{Z^2} = 4cos^2\theta$ M1

$2cos^2\theta = cos2\theta + 1$ A1

5.

$2(x^2 + 4x) - 3(y^2 - 6y) = 43$ M1

$2[(x+2)^2 - 4] - 3[(y-3)^2 - 9] = 43$ M1

$\frac{(x+2)^2}{12} - \frac{(y-3)^2}{8} = 1$ A1

$c = \sqrt{20}$ A1

$Foci = (-2 \pm \sqrt{20}, 3\ )$ A1

$Vertices = (-2 \pm \sqrt{12}, 3)$ A1

Equation of Asymptotes,

$y - 3 = \pm\sqrt{\frac{8}{12}(x+2)}$ M1

$y = \pm\sqrt{\frac{2}{3}(x+2)} + 3$ A1

6.

$b_1 = \begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix}$ $b_2 = \begin{pmatrix} 4 \\ 8 \\ -5 \end{pmatrix}$

$b_1 \bullet b_2 = \begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix} \bullet \begin{pmatrix} 4 \\ 8 \\ -5 \end{pmatrix} = -27$ M1A1

$\cos\theta = \frac{-27}{\sqrt{14} \times \sqrt{105}}$ M1

$\theta = 134.8^0$

$= 134^o46'$

7 a) $p(1) = h + k + 2 - 2 = 0$
$p(2) = 16h + 4k + 4 - 2 = -10$ ..... Either M1

$h + k = 0 \quad \cdots\cdots (1)$
$4h + k = -3 \cdots\cdots (2)$ ..... Both equations A1

$h = -1$ ..... Both A1
$k = 1$

b) $p(x) = (x-1)(-x^3 - x^2 + 2)$ A1

$let\ g(x) = -x^3 - x^2 + 2$ M1

$p(x) = -(x-1)^2(x^2 + 2x + 2)$ A1

$$(x-1)\overline{)-x^4 + 0 + x^2 + 2x - 2}\ \ -x^3 - x^2 + 2$$
$$-(-x^4 + x^3)$$
$$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$$
$$-x^3 + x^2$$
$$-(-x^3 + x^2)$$
$$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$$
$$2x - 2$$
$$2x - 2$$
$$\cdots\cdots\cdots\cdots$$

..... M1

c) $Quadratic\ function\ is - (x^2 + 2x + 2)$ B1

(i) $f(x) = -[x^2 + 2x + (1)^2 - (1)^2 + 2]$ M1

$x \in R$ ..... A1 $since\ (x+1)^2 < 0$

(ii) $maximum\ value\ is - 1$ B1

..... B1 $when\ x = -1$

d) $-(x^2 + 2x + 2) > (6x - 1)$ because $(x-1)^2 \geq 0\ \ for\ x \in R$ M1

$x^2 + 8x + 1 < 0$
$x^2 + 8x + 4^2 - 4^2 + 1 < 0$
$(x+4)^2 - 15 < 0$ M1

$(x+4)^2 < 15$ A1

$\{\ x: -\sqrt{15} - 4 < x < \sqrt{15} - 4\}$

[15m]

8.

TAMAT SAMPEL

Suka sampel ini?

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