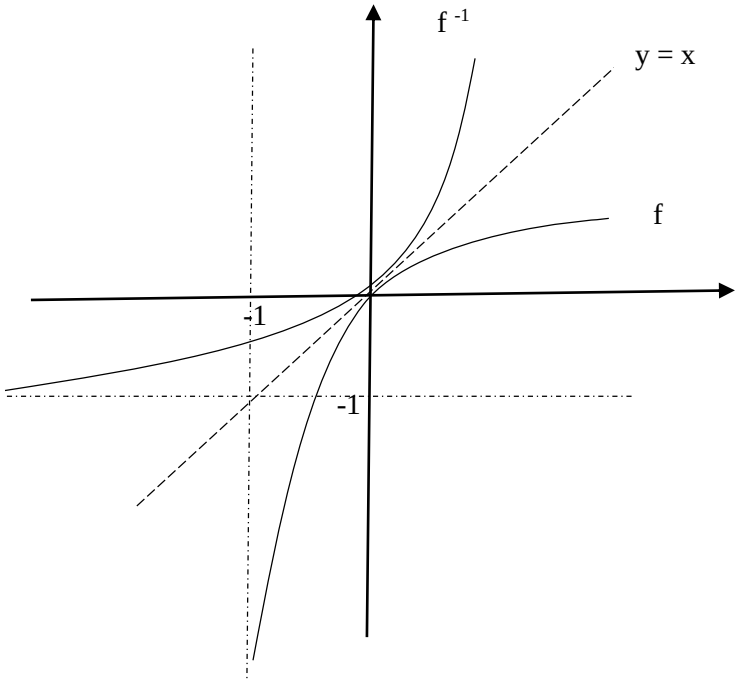
3 (a)	$16y^3 + 9x^2y - 54x = 0$ $48y^2\frac{dy}{dx} + 9x^2\frac{dy}{dx} + 18xy - 54 = 0$ $48y^2\frac{dy}{dx} + 9x^2\frac{dy}{dx} = 54 - 18xy$ $\frac{dy}{dx}[48y^2 + 9x^2] = 54 - 18xy$ $\frac{dy}{dx} = \frac{54 - 18xy}{48y^2 + 9x^2} = \frac{6(3 - xy)}{16y^2 + 3x^2}$	M1A1 A1
(b)	$\frac{dy}{dx} = 0$ $\frac{6(3 - xy)}{16y^2 + 3x^2} = 0$ $(3 - xy) = 0$ $xy = 3$ $x = \frac{3}{y}$ $16y^3 + 9\left(\frac{3}{y}\right)^2 y - 54\left(\frac{3}{y}\right) = 0$ $16y^3 + \frac{81}{y} - \frac{162}{y} = 0$ $16y^3 - \frac{81}{y} = 0$ $16y^4 - 81 = 0$ $(4y^2 + 9)(4y^2 - 9) = 0$ $(4y^2 + 9)(2y + 3)(2y - 3) = 0$ $y = -\frac{3}{2}$ *or* $y = \frac{3}{2}$ When $y = -\frac{3}{2}, x = -2$, When $y = \frac{3}{2}$, $x = 2$ The points where $\frac{dy}{dx} = 0$ are $\left(-2, -\frac{3}{2}\right)\left(2, \frac{3}{2}\right)$ OR $y^4 = \frac{81}{16}$ $y = -\frac{3}{2}$ *or* $y = \frac{3}{2}$	M1 M1 A1 A1
		Q3 [7]

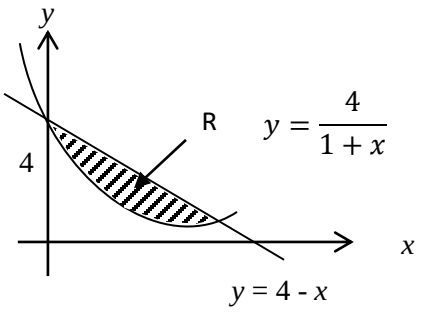
4(a)	$\|M\| = a\begin{vmatrix} a & 1 \\ 2 & 1 \end{vmatrix} - (-a)\begin{vmatrix} 3 & 1 \\ 4 & 1 \end{vmatrix} + 1\begin{vmatrix} 3 & a \\ 4 & 2 \end{vmatrix}$ $= a(a-2) + a(3-4) + (6-4a)$ $= a^2 - 7a + 6$	M1A1 A1
(b)	$\|M\| = 0$ $a^2 - 7a + 6 = 0$ $(a-6)(a-1) = 0$ $a = 6, 1$	M1 (equal to zero) A1
(c)	$\left(\begin{array}{ccc\|c} 6 & -6 & 1 & 3k \\ 3 & 6 & 1 & 0 \\ 4 & 2 & 1 & k \end{array}\right)$	B1
	$\frac{1}{6}R_1 \left(\begin{array}{ccc\|c} 1 & -1 & \frac{1}{6} & \frac{1}{2}k \\ 3 & 6 & 1 & 0 \\ 4 & 2 & 1 & k \end{array}\right)$	
	$-3R_1 + R_2 \left(\begin{array}{ccc\|c} 1 & -1 & \frac{1}{6} & \frac{1}{2}k \\ 0 & 9 & \frac{1}{2} & -\frac{3}{2}k \\ 4 & 2 & 1 & k \end{array}\right)$	
	$-4R_1 + R_3 \left(\begin{array}{ccc\|c} 1 & -1 & \frac{1}{6} & \frac{1}{2}k \\ 0 & 9 & \frac{1}{2} & -\frac{3}{2}k \\ 0 & 6 & \frac{1}{3} & -k \end{array}\right)$	M1
	$\frac{1}{9}R_2 \left(\begin{array}{ccc\|c} 1 & -1 & \frac{1}{6} & \frac{1}{2}k \\ 0 & 1 & \frac{1}{18} & -\frac{1}{6}k \\ 0 & 6 & \frac{1}{3} & -k \end{array}\right)$	
	$-6R_2 + R_3 \left(\begin{array}{ccc\|c} 1 & -1 & \frac{1}{6} & \frac{1}{2}k \\ 0 & 1 & \frac{1}{18} & -\frac{1}{6}k \\ 0 & 0 & 0 & 0 \end{array}\right)$	M1A1
	Since Row 3 has all zero entries, the equations have infinite number of solution	B1

(d)	$y+\frac{1}{18}z=-\frac{1}{6}k$ $x-y+\frac{1}{6}z=\frac{1}{2}k$ $y=t, t\in R$ $t+\frac{1}{18}z=-\frac{1}{6}k$ $z=-3k-18t$ $x=t-\frac{1}{6}(-3k-18t)+\frac{1}{2}k$ $x=4t-k$	M1 A1 (all correct)
		Q4 [12]
5	$\frac{2x+1}{(x^2+1)(2-x)}\equiv\frac{Ax+B}{x^2+1}+\frac{C}{2-x}$ $2x+1=Ax+B(2-x)+C(x^2+1)$ When $x=2$, $5=5C$ $C=1$ When $x=0$, $1=2B+C$ $B=0$ When $x=1$, $3=(A+B)+2C$ $A=1$ $\therefore\ \frac{2x+1}{(x^2+1)(2-x)}\equiv\frac{x}{x^2+1}+\frac{1}{2-x}$ $\int_0^1\frac{2x+1}{(x^2+1)(2-x)}\,dx=\int_0^1\frac{x}{x^2+1}+\frac{1}{2-x}\,dx$ $=\left[\frac{1}{2}\ln(x^2+1)-\ln(2-x)\right]_0^1$ $=\frac{1}{2}(\ln 2)-\ln 1-\left(\frac{1}{2}\ln 1-\ln 2\right)$ $=\frac{1}{2}(\ln 2)+ln2$ $=\frac{3}{2}ln2\ or\ 1.0397\ or\ 1.04$	M1A1 A1 M1A1 M1 A1
		Q5 [7]

6	$e^x \frac{dy}{dx} - y^2(x+1) = 0$ $e^x \frac{dy}{dx} = y^2(x+1)$ $\frac{dy}{y^2} = \left(\frac{x+1}{e^x}\right) dx$ $\int \frac{1}{y^2}\, dy = \int \left(\frac{x+1}{e^x}\right) dx$ $\int y^{-2}\, dy = \int (x+1)e^{-x}\, dx$ $\frac{y^{-1}}{-1} = (x+1)(-e^{-x}) - \int -e^{-x}(1)\, dx$ $-\frac{1}{y} = -\frac{x+1}{e^x} + \int e^{-x}(1)\, dx$ $-\frac{1}{y} = -\frac{x+1}{e^x} + (-e^{-x}) + c$ $-\frac{1}{y} = -\frac{x+1}{e^x} - \frac{1}{e^x} + c$ When $x = 0, y = 1,\ c = 1$ $-\frac{1}{y} = -\frac{x+1}{e^x} - \frac{1}{e^x} + 1$ $-\frac{1}{y} = \frac{-(x+1) - 1 + e^x}{e^x}$ $y = \frac{e^x}{x + 2 - e^x}$	M1 (separate & ready to integrate) M1 (correct u and dv) M1 A1 M1 (find C) A1
		Q6 [6]

SECTION B

NO.	ANSWERS	MARKS
7(a)		D1 (f correct) D1 (f -1and y =x) D1 (all correct)
(b)	$R_f = \{y: y \in R\}$ $D_g = \{x: x \in R\}$ Since $R_f \subseteq D_g$, therefore g o f exists $gf(x) = g[\ln(1+x)]$ $= 1 - e^{-\ln(1+x)}$ $= 1 - \frac{1}{1+x}$ or $\frac{x}{1+x}$ $R_{gf} = \{y: y \in R, y \neq 1\}$	M1 A1 M1 A1 B1

(c)	$k = -2$ $y = x^2 + 4x$ $y = (x+2)^2 - 2^2$ $(x+2)^2 = y + 4$ $x = \pm\sqrt{y+4} - 2$ $Since\ x > -2,\ \ x = \sqrt{y+4} - 2$ $h^{-1}(x) = \sqrt{x+4} - 2$	B1 M1 M1 A1
(d)	$(g \circ h)(x) = 1 - e^3$ $1 - e^{-(x^2+4x)} = 1 - e^3$ $e^{-(x^2+4x)} = e^3$ $-(x^2 + 4x) = 3$ $x^2 + 4x + 3 = 0$ $(x+3)(x+1) = 0$ $x = -3, -1$	 M1 (gh) M1 (quadratic eqn) A1
8 (a)	$y = 4 - x$ ……. (1) $y = \frac{4}{1+x}$ ……. (2) $4 - x = \frac{4}{1+x}$ $(4-x)(1+x) = 4$ $-x^2 + 3x + 4 = 4$ $x^2 - 3x = 0$ $x(x-3) = 0$ $x = 0$ or $x = 3$ $y = 0$ or $y = 1$ Points of intersection are (0,4) and (3, 1)  	 M1 A1 (both) A1 (both) D1:Correct shape for both graphs with 2 points of intersection D1:perfect with intersection at (0,4), (3,1)

(b)	Area of R = $\int_0^3 (4 - x - \frac{4}{1+x})dx$ $= [4x - \frac{x^2}{2}$-4ln $\|1 + x\|]_0^3$ $= 12 - \frac{9}{2} - 4ln4$ $= \frac{15}{2} - 4(2ln2)$ $= \frac{15}{2} - 8ln2$ $= \frac{1}{2}(15 - 16ln2)$	M1A1 M1 M1 A1
(c)	Volume of R = $\pi \int_0^3 (4-x)^2 - (\frac{4}{1+x})^2 dx$ $= \pi \int_0^3 (4-x)^2 - \frac{16}{(1+x)^2} dx$ $= \pi[\frac{(4-x)^3}{-3} + 16(1+x)^{-1}]_0^3$ $= \pi[-\frac{1}{3} + 4 - \left(-\frac{1}{3}(4^3) + 16\right)]$ $= \pi(-\frac{1}{3} + 4 + \frac{64}{3} - 16)$ $= 9\pi$ unit^3	M1 A1 M1 M1 A1 15 marks

Suka sampel ini?

Kertas Percubaan STPM

Sem 1 · Mathematics M

- 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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