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Subject A Math

Date 4/8/2026

Nothing is to be written on this margin

Q	1	2a	2b	3	4	5	6a	6b
M	3	1	3	4	3	0	0	2

C.T Group/Class 301

Serial No 30

23/30

1.) $3x^3 + ax^2 + bx + 9 = (x^2 - 1)(cx^3 + dx^2 + ex + f) - 5x + 7$

$3x^3 + ax^2 + bx + 9 = cx^5 + dx^4 + ex^3 + fx^2 - cx^3 - dx^2 - ex - f - 5x + 7$

$-f + 7 = 9$

$-f = 2 \quad f = -2$

$-2x^2 - 2x^2 = d$

$(-2d) \times 4 - 2 - d = b$

$4e - c = 3 \quad e = 3 + c$

$-e - 5 = b$

$c = 0 \quad d = 0$

$e = -3 \quad a = -2$

$b = -8$

Follow instruction.

3

3

2a)

$$f(x) = 8x^3 - 18x^2 - 3x - 5$$

$$2x - 5 \Rightarrow x = \frac{5}{2}$$

$$f\left(\frac{5}{2}\right) = 8\left(\frac{5}{2}\right)^3 - 18\left(\frac{5}{2}\right)^2 - 3\left(\frac{5}{2}\right) - 5 = 0$$

$\therefore 2x - 5$ is a factor of $f(x)$

2b)

$$8x(2x-5)(4x^2+ax+1) = 8x^3 - 18x^2 - 3x - 5$$

by comparing coefficient of x

$$-5a + 2 = -3$$

$$a = 1$$

$$4x^2 + x + 1$$

$$a = 4 \quad b = 1 \quad c = 1$$

$$f(x) = (2x - 5)(4x^2 + x + 1)$$

$$x = \frac{-1 \pm \sqrt{1^2 - 4(4)(1)}}{2(4)}$$

$$4x^2 + x + 1 = 0 \quad (P)$$

$$x = \frac{-1 \pm \sqrt{1^2 - 4(4)(1)}}{8}$$

$$x = \frac{-1 \pm \sqrt{-15}}{8}$$

no real roots

$\therefore f(x)$ only has one real root $\Rightarrow x = \frac{5}{2}$

3)

$$\log_a \left[2 + \frac{\log_2 x}{\log_2 a} \right]$$

$$\log_a [2 + \log_2(x-4)] = \log_a 3$$

$$2 + \log_2(x-4) = 3$$

$$\log_2(x-4) = 1$$

$$\log_2(x-4) = \log_2 2$$

$$x - 4 = 2$$

$$(P) \quad x = 6$$

write 6 properly

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Q	7	8							
M	4	4							

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4)

$$\log 7^x = \log 14^{x-1}$$

$$x \log 7 = (x-1) \log 14$$

$$\frac{x}{x-1} = \frac{\log 14}{\log 7}$$

$$\frac{x}{x-1} = \frac{\log 14}{\log 7^2}$$

$$7^x = 2^{x-1} \times 7^{x-1}$$

$$7^x = \frac{2^x}{2} \times \frac{7^x}{7}$$

$$(14) 7^x = 2^x \times 7^x$$

$$14 = 2$$

$$\log 14 = x \log 2$$

$$x = \frac{\log 14}{\log 2}$$

$$x = \log_2 14$$

$$\frac{\lg 14}{\lg 2}$$

①

3

5)

$$\ln y = \ln(5 - e^{2x})$$

$$\ln y = \ln(5 - e^{2x})$$

$$\ln e^{2x} = \ln(5 - y)$$

$$\ln y = \ln 5 - 2x$$

$$2x = \ln(5 - y)$$

$$\ln y = -2x + \ln 5$$

$$\ln 5 = 5 - e^{2x}$$

$$k = 0.611 (3.s.f)$$

$$\ln(\ln 5) = \ln(5 - e^{2x})$$

$$\ln 5 = 5 - e^{2x}$$

$$e^{2x} = 5 - \ln 5$$

$$\ln e^{2x} = \ln(5 - \ln 5)$$

$$2x = \ln(5 - \ln 5)$$

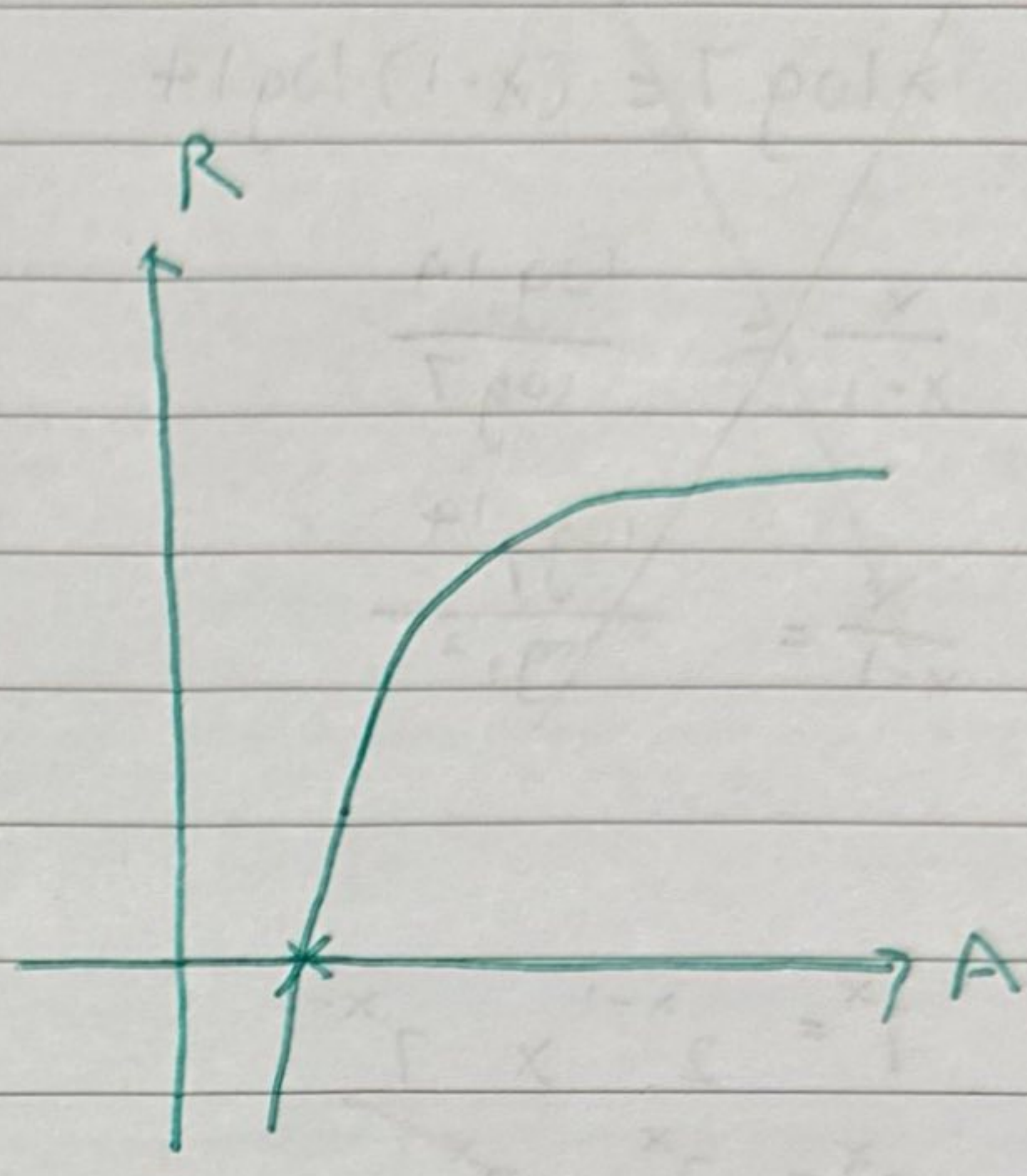
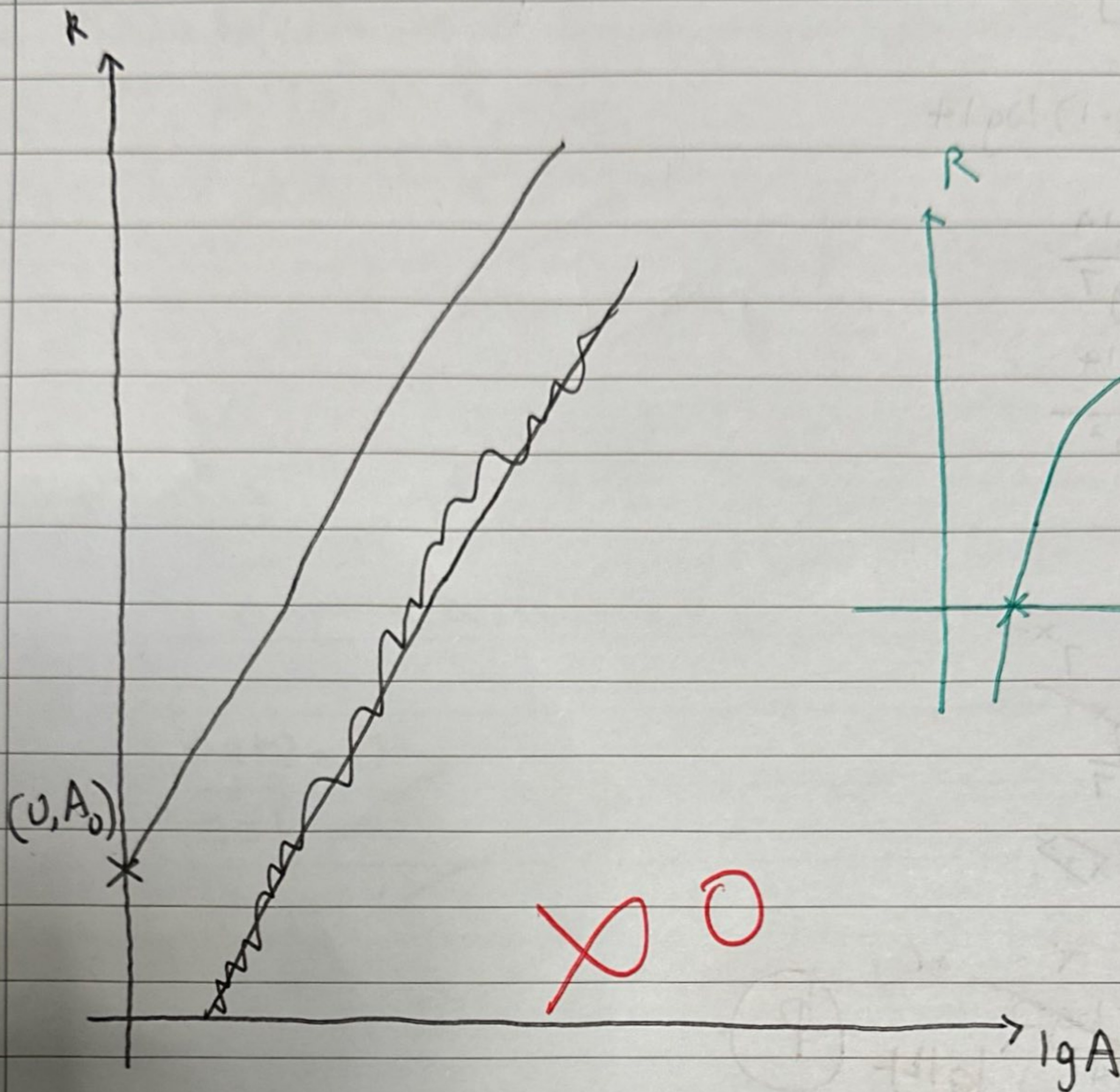
$$x = \frac{\ln(5 - \ln 5)}{2}$$

$$x = 0.6105$$

$$x = \ln 5$$

$$y = 5 - e^{2 \ln 5}$$

6a)



6b) $5.6 = \lg A - \lg 0.4$

~~5.6~~

$5.6 + \lg 0.4 = \lg A$

$A = 10^{5.6 + \lg 0.4}$

$= 159242$

$= 159000 (3s.s)$

(2)

2

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7) $\sqrt{y} = Y \times \frac{1}{2} X$

$Y = mX + c$

$\frac{2 - (-13)}{2 - (-3)} = 3$

$Y = 3X + c$

$Y = 3X - 4$

$\sqrt{y} = 3X - 4$

$y = (3X - 4)^2$

4

8) ~~$\ln a e^y = \ln b^{2x+1}$~~

~~$\ln a + y = (2x+1) \ln b$~~

~~$y = (2x+1) \ln b - \ln a$~~

$a e^y = b^{2x+1}$

$\ln a + y = \ln b^{2x+1}$

$y = 2x \ln b + \ln b - \ln a$

$\therefore$ We can plot a graph of y against X with $\ln b$ as gradient and $\ln b - \ln a$ as constant.

	Y	X	m	c
$a e^y = b^{2x+1}$	y	2X	$\ln b$	$\ln b - \ln a$

4

8

- 1 It is given that $3x^3 + ax^2 + bx + 9 = (x^2 - 1)Q(x) - 5x + 7$ for all values of x , where $Q(x)$ is a polynomial, a and b are real numbers.
By substituting **suitable** values of x , find the value of a and of b . [4]
- 2 It is given that $f(x) = 8x^3 - 18x^2 - 3x - 5$.
(a) Show that $2x - 5$ is a factor of $f(x)$. [1]
(b) Factorise $f(x)$ and show that there is only one real root for $f(x) = 0$. [4]
- 3 Solve the equation $\log_9[2 + \log_2(x - 4)] = \log_{25} 5$. [4]
- 4 Show that the solution of the equation $7^x = 14^{x-1}$ is $x = \log_2 14$. [3]
- 5 The curve $y = 5 - e^{2x}$ passes through the point $(\ln 5, k)$. Find the value of k . [2]
- 6 The Richter scale is a measurement of the strength of an earthquake by comparing the seismic wave amplitude to that of a baseline earthquake. Its formula is given by $R = \lg \frac{A}{A_0}$, where R is the magnitude of the earthquake, A is the amplitude in μm recorded on the seismograph, and A_0 is the amplitude in μm measured on a baseline earthquake based on the distance from the epicenter.
(a) Sketch the graph of R against A , showing clearly the intercepts with the axes, if any. [2]
(b) Given $A_0 = 0.4$, find the value of A , correct to 3 significant figures, for an earthquake of magnitude 5.6. [2]

[Turn Over]

7 When the graph of $\sqrt{y}$ against x^4 is drawn, a straight line is obtained which passes through the points (2, 2) and (−3, −13). Express y in terms of x . [4]

8 Variables x and y are related by the equation $ae^y = b^{2x+1}$, where a and b are unknown constants.

Explain clearly how a straight line graph in the form $Y = mX + c$ can be drawn to represent this equation where X and Y are each an expression of x and/or y , m and c are constants in terms of a and/or b .

Copy and complete the table below. [4]

	Y	X	m	c
$ae^y = b^{2x+1}$				

End of Paper