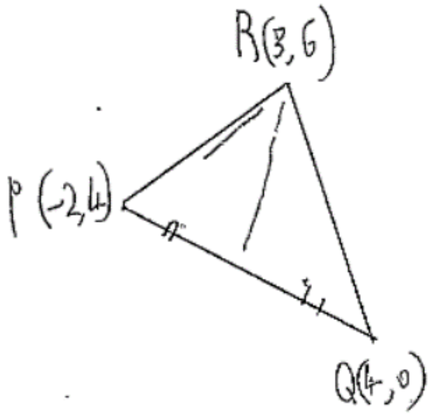
Candidate 1 evidence — question 1



$$\frac{-2+4}{2}, \frac{4+0}{2}$$

$$(1, 2)$$

$$\frac{6-2}{3-1} = \frac{3}{2}$$

$$y-2 = \frac{3}{2}(x-1)$$

$$2y-4 = 3x-3$$

$$2y = 3x+1$$

Candidate 2 evidence — question 1

$P(\overset{x_1}{-2}, \overset{y_1}{4}) \quad Q(\overset{x_2}{4}, \overset{y_2}{0})$

$$\text{midpoint } PQ = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$= \left(\frac{-2+4}{2}, \frac{4+0}{2}\right)$$

$$= (1, 2)$$

$(3, 6)$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{0-4}{4-(-2)}$$

$$= \frac{-4}{6}$$

$$= -\frac{2}{3}$$

$$m_{perp} = \frac{3}{2}$$

$$y - b = m(x - a)$$

$$y - 6 = \frac{3}{2}(x - 3)$$

$$3y - 18 = 2(x - 3)$$

$$3y - 18 = 2x - 6$$

$$2x - 3y + 12 = 0$$

Candidate 3 evidence — question 2

$$g(x) = \frac{1}{5}x - 4$$

$$y = \frac{1}{5}x - 4$$

$$5y = x - 4$$

$$x - 4 = 5y$$

$$x = 5y + 4$$

$$g^{-1}(x) = 5x + 4$$

Candidate 4 evidence — question 2

$$g(x) = \frac{1}{5}x - 4$$

$$x = \frac{1}{5}y - 4$$

$$x + 4 = \frac{1}{5}y$$

$$\frac{x+4}{\frac{1}{5}} = y$$

$$g'(x) = 5(x+4)$$

$$\underline{g'(x) = 5x + 20}$$

Candidate 5 evidence — question 3

$h(x) = 3\cos 2x$

$h'(x) = -6\sin 2x$

$h'\left(\frac{\pi}{6}\right) = h'(30) = -6\sin 2(30)$

$\cancel{-6\sin 2x = -6(\sin 60 \cos 60)}$

$\cancel{= -6\left(\frac{\sqrt{3}}{2} \cdot \frac{1}{2}\right)}$

$\cancel{= -6\left(\frac{\sqrt{3}}{4}\right)}$

$\cancel{= \frac{-6\sqrt{3}}{4}}$

$h'\left(\frac{\pi}{6}\right) = -6\sin 60$

$h'\left(\frac{\pi}{6}\right) = -6 \cdot \frac{\sqrt{3}}{2}$

$h'\left(\frac{\pi}{6}\right) = \frac{-6\sqrt{3}}{2}$

Candidate 6 evidence — question 3

$h(x) = 3\cos 2x$

$h'(x) = -2 \times 3 \cdot \sin 2x$

$= -6\sin 2x$

$h'\left(\frac{\pi}{6}\right) = -6\sin 2\left(\frac{\pi}{6}\right)$

$= -6\sin 2(30^\circ)$

$= -6 \times 2\left(\frac{1}{2}\right)$

$= \underline{-6}$

Candidate 7 evidence — question 4

$x^2+y^2-12x-6y-23=0$

Centre $=(6,3)$ $\quad$ $K(8,-5)$

$m=\frac{y_2-y_1}{x_2-x_1}=\frac{3--5}{6-8}=-\frac{8}{2}=-4$

$m \times m_\perp=-1$ for perp lines

$-4 \times m_\perp=-1$

$m_\perp=\frac{1}{4}$

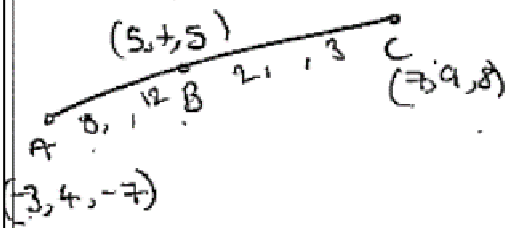
$y-b=m(x-a)$

$y+5=\frac{1}{4}(x-8)$

Candidate 8 evidence — question 5

$\frac{8}{2} = 4$

$\frac{12}{3} = 4$



$4 : 1$

$\underline{\underline{t = 8}}$ as $\frac{4}{1} = 4$

$$\begin{array}{ll} & \text{A-2} \quad \text{B 2} \quad \text{C 2} \\ A & (-3,\ 4,\ -7) \\ & \downarrow 8 \quad \downarrow 4 \quad \downarrow 12 \\ B & (5,\ 8,\ 5) \\ & \downarrow 2 \quad \downarrow 1 \quad \downarrow 3 \\ C & (7,\ 9,\ 8) \end{array}$$

~~the difference~~

$\frac{8}{2} = 4$

$\frac{4}{1} = 4$

$\frac{12}{3} = 4$

Candidate 9 evidence — question 5

$\overrightarrow{AB}$ $\qquad$ $\overrightarrow{BC}$

$= \underset{\sim}{b} - \underset{\sim}{a}$ $\qquad$ $= \underset{\sim}{c} - \underset{\sim}{b}$

$= \begin{pmatrix} 5 \\ t \\ 5 \end{pmatrix} - \begin{pmatrix} -3 \\ 4 \\ -7 \end{pmatrix}$ $\qquad$ $= \begin{pmatrix} 7 \\ 9 \\ 8 \end{pmatrix} - \begin{pmatrix} 5 \\ t \\ 5 \end{pmatrix}$

$= \begin{pmatrix} 8 \\ t-4 \\ 12 \end{pmatrix}$ $\qquad$ $= \begin{pmatrix} 2 \\ 9-t \\ 3 \end{pmatrix}$

ratio $= \frac{1}{4}\overrightarrow{AB} = \overrightarrow{BC}$

$\frac{1}{4}(t-4) = 9-t$

$\frac{1}{4}t - 1 = 9 - t$

$\frac{1}{4}t = 10 - t$

$\frac{5}{4}t = 10$

$\underline{\underline{t = 8}}$

$\frac{5}{4} = 1{\cdot}25$ $\qquad$ $10 = \frac{40}{4}$

$\frac{40}{4} \div \frac{5}{4}$

$= \frac{40}{4} \times \frac{4}{5}$

$= \frac{160}{20}$

$= 8 \therefore t = 8$

Candidate 10 evidence — question 5

$A(-3,4,-7)$ 4 $B(5,t,5)$ 1 $C(7,9,8)$

$-3 \xrightarrow[8]{} 5 \xrightarrow[2]{} 7$

$\cancel{4}\ -7 \xrightarrow[12]{} 5 \xrightarrow[3]{} 8$

B divides AC in the ratio 4 : 1

$4BC = AB$

$-3 \xrightarrow[8]{} 5 \xrightarrow[2]{} 7$

$-7 \xrightarrow[12]{} 5 \xrightarrow[3]{} 8$

$4 \xrightarrow[36]{} t \xrightarrow[9]{} 9$

$t = 40$

Candidate 11 evidence — question 6

$\cancel{25}\ \cancel{27}$

$\log_5(250) - \log_5(8^{\frac{1}{3}})$

$\log_5\left(\frac{250}{8^{\frac{1}{3}}}\right)$

Candidate 12 evidence — question 6

$\log_5 250 - \frac{1}{3}\log_5 8$

$\log_5 250 - \log_5 8^{1/3}$

$\log_5 250 - \log_5 8/3$

$\log_5 \frac{250}{8/3}$

$= \log_5 \frac{750}{8}$

$=$

Candidate 13 evidence — question 7(c)

$y = y$

$x^3 - 3x^2 + 2x + 5 = 2x + 5$.

$3x^2 - 6x + 2 = 2$

$3x^2 - 6x = 0$

$3x(x-2) = 0$

$x = 0 \quad x = 2$

when $x = 2$

$y = 2(2) + 5$

$y = 4 + 5$

$y = 9$

$\underline{\underline{Q(2, 9)}}$

Candidate 14 evidence — question 7(c)

$2x+5 = x^3-3x^2+2x+5$

$x^3-3x^2+2x+5-2x+5$

x^3-3x^2

$\frac{dy}{dx} = 3x^2-6x$

$3x(1-2)$

$3x(-3)=0$

$3x=-3$

$x=1$

when $x=1$

$y=2(1)+5$

$y=7$

$(1,7)$

Candidate 15 evidence — question 8

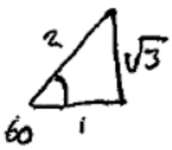
$y-\sqrt{3}x+5=0$

$y=\sqrt{3}x+5$

$m=\sqrt{3}$

~~tan~~

$\tan\sqrt{3} = \underline{\underline{60^\circ}}$



$\tan = \frac{O}{A}$

S | A
T | C

Candidate 16 evidence — question 9

$\vec{BC} = -\underline{t} + \underline{u}$

$\cancel{\vec{MD} = [illegible]}$

$\cancel{\vec{MD} = [illegible]}$

$\cancel{\vec{AD} = -\tfrac{1}{2}\underline{t} + v}$

$\cancel{\vec{MD} = -\tfrac{1}{2}\underline{t} + \underline{u} + \underline{v}}$

$\cancel{\vec{MD} = -\tfrac{1}{2}t +}$

$\cancel{\vec{MD} = -\tfrac{1}{2}t + v - u}$

$\vec{MD} = -\tfrac{1}{2}t + v - u$

Candidate 17 evidence — question 10

$$\frac{dy}{dx} = 6x^2 - 3x + 4$$

$$\int 6x^2 - 3x + 4 \, dx$$

$$= \frac{6x^3}{3} - \frac{3x^2}{2} + 4x + c$$

$$= 2x^3 - \frac{3x^2}{2} + 4x + c$$

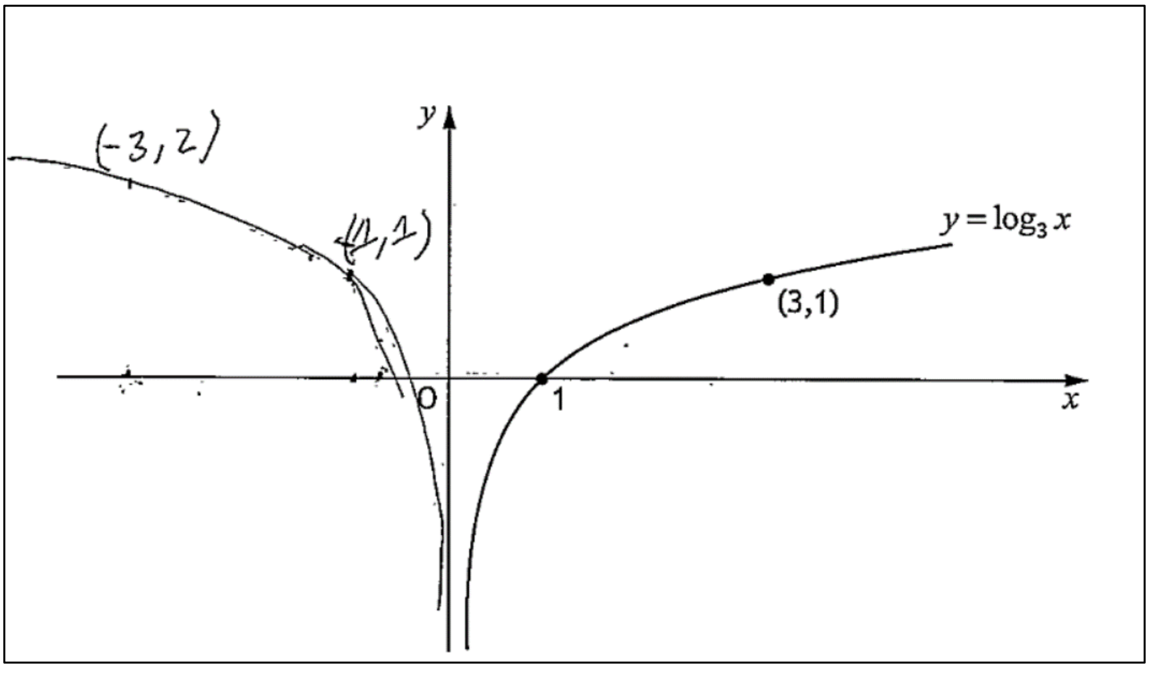
$$14 = 2(2)^3 - \frac{3(2)^2}{2} + 4(2) + c$$

$$14 = 16 - 6 + 8 + c$$

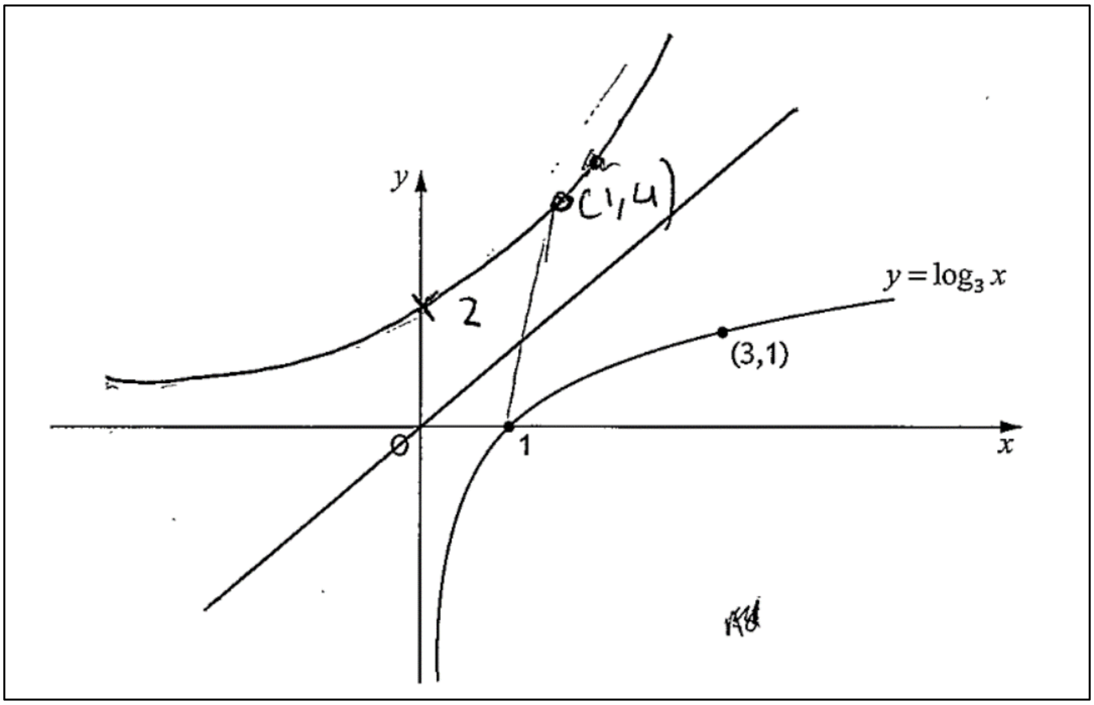
$$14 = 18 + c$$

$$c = -4$$

Candidate 18 evidence — question 11(a)



Candidate 19 evidence — question 11(a)



Candidate 20 evidence — question 12(a)

$2\underline{a} + \underline{b}$

$$2\begin{pmatrix} 4i \\ -2j \\ +2k \end{pmatrix} + \begin{pmatrix} -2i \\ j \\ pk \end{pmatrix}$$

$$\begin{pmatrix} 8i \\ -4j \\ 4k \end{pmatrix} + \begin{pmatrix} -2i \\ j \\ pk \end{pmatrix}$$

$$2\underline{a} + \underline{b} = \begin{pmatrix} 6i \\ -3j \\ 4k+pk \end{pmatrix}$$

Candidate 21 evidence — question 12(b)

$$|2a+b| = \sqrt{6^2 + (-3)^2 + (4+p)^2}$$

$$7 = \sqrt{36 + 9 + (16 + p^2)}$$

$$7 = \sqrt{61 + p^2}$$

$$p^2 = -12$$

$$p = \pm\sqrt{12}$$

$$\begin{array}{r} {}^{5}\cancel{6}{}^{1}1 \\ -\ 49 \\ \hline 12 \end{array}$$

Candidate 22 evidence — question 12(b)

$$|2a+b| = \sqrt{6^2 - 3^2 + (4+p)^2}$$

$$= \sqrt{36+9+16+4p+4p+p^2}$$

$$= \sqrt{p^2+8p+61} = 7$$

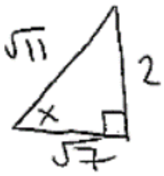
$$= (p^2+8p+61)^{\frac{1}{2}} = 7$$

$$= p^2+8p+61 = \sqrt{7}$$

$$(p \quad)(p \quad) = \sqrt{7}$$

Candidate 23 evidence — question 13(a)

$\sin x = \frac{2}{\sqrt{11}}$



a) $\sin 2x = 2\sin A\cos A$

$= 2\left(\frac{2}{\sqrt{11}}\right) \times \left(\frac{\sqrt{7}}{\sqrt{11}}\right)$

$= \left(\frac{4}{2\sqrt{11}}\right) \times \left(\frac{\sqrt{7}}{\sqrt{11}}\right)$

$= \frac{4\sqrt{7}}{22}$

$\frac{2\sqrt{7}}{11}$

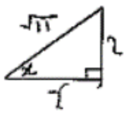
$\cos 2x = \cos^2 A - \sin^2 A$

$= \left(\frac{\sqrt{7}}{\sqrt{11}}\right)^2 - \left(\frac{2}{\sqrt{11}}\right)^2$

$= \left(\frac{7}{11}\right) - \left(\frac{4}{11}\right)$

$= \frac{3}{0} = 3$

Candidate 24 evidence — question 13(a)



$\sin x = \frac{2}{\sqrt{11}}$ $\cos x = \frac{7}{\sqrt{11}}$ $11 - 4$

$\cancel{\sin 2x = 2\left(\frac{2}{\sqrt{11}}\right) = \frac{4}{\sqrt{11}}}$

$\sin 2x = 2\sin x\cos x$

$= 2\left(\frac{2}{\sqrt{11}}\right) \cdot \left(\frac{7}{\sqrt{11}}\right)$

$= \frac{4}{\sqrt{11}} \cdot \frac{7}{\sqrt{11}}$

$= \frac{28}{\sqrt{121}}$

$= \frac{28}{11}$

$\cos 2x = \cos^2 x - \sin^2 x$

$= \left(\frac{7}{\sqrt{11}}\right)^2 - \left(\frac{2}{\sqrt{11}}\right)^2$

$= \frac{49}{11} - \frac{4}{11}$

$= \frac{45}{11}$

Candidate 25 evidence – question 13(b)

$$\sin 3x = \sin(2x + x)$$
$$= \sin 2x + \sin x$$
$$= 2\sin x \cos x + \sin x$$
$$= 2 \times \frac{2}{\sqrt{11}} \times \frac{7}{\sqrt{11}} + \frac{2}{\sqrt{11}}$$
$$= 2 \times \frac{14}{11} + \frac{2}{\sqrt{11}}$$
$$= \frac{28}{11} + \frac{2}{\sqrt{11}} \begin{matrix} \times\sqrt{11} \\ \times\sqrt{11} \end{matrix}$$
$$= \frac{28}{11} + \frac{2\sqrt{11}}{11}$$
$$= \frac{28 + 2\sqrt{11}}{11}$$

Candidate 26 evidence — question 14

$$\int_{-4}^{9} \frac{1}{\sqrt[3]{(2x+9)^2}}\,dx$$

$$=\int_{-4}^{9}\left(\frac{1}{\sqrt[3]{4x^2+36x+81}}\right)dx$$

$$=\int_{-4}^{9}\left(4x^2+36x+81\right)^{-1/3}dx$$

$$=\left[\frac{4x^3}{3}+\frac{36x^2}{2}+81x\right]_{-4}^{9}$$

$$=\left[\frac{4x^3}{3}+18x^2+81x\right]_{-4}^{9}$$

$$=\left(\frac{4(9)^3}{3}+18(9)^2\right.$$

Candidate 27 evidence — question 14

$$\int_{-4}^{9} \frac{1}{\sqrt[3]{(2x+9)^2}}\,dx$$

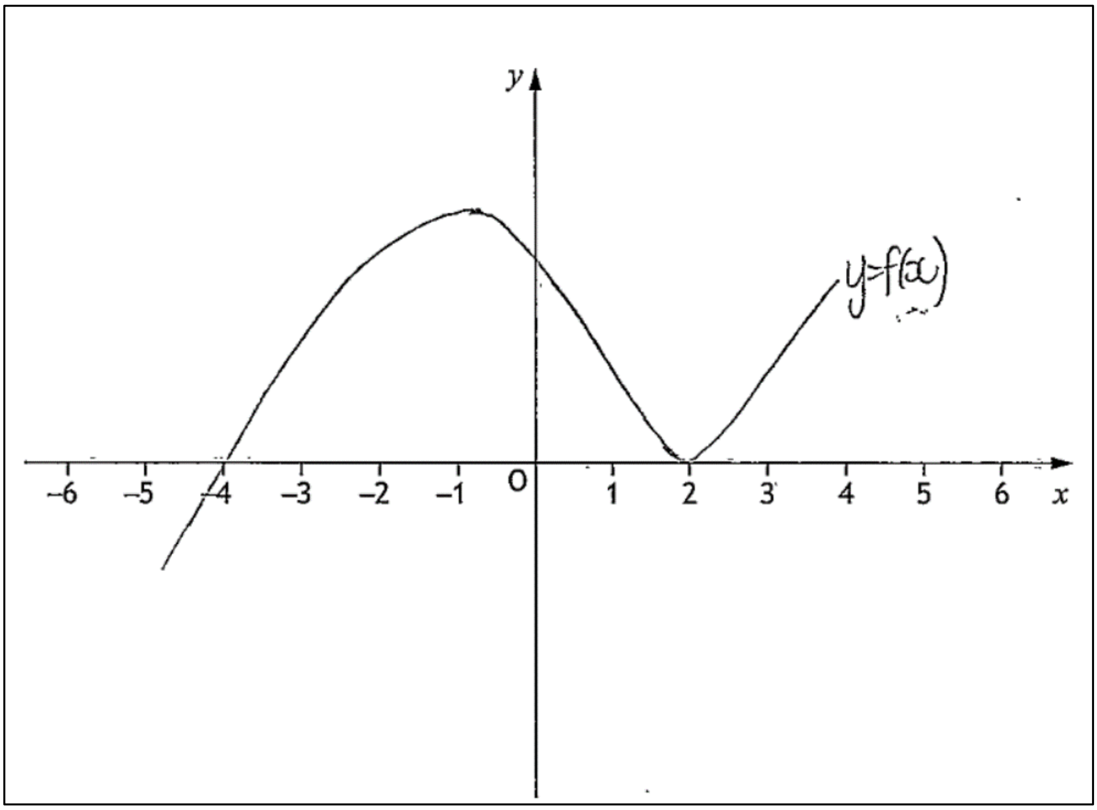
$$= \int_{-4}^{9} (2x+9)^{-\frac{2}{3}}\,dx$$

$$= \left[3(2x+9)^{\frac{1}{3}}\right]_{-4}^{9} = \left[3\left(\sqrt[3]{2x+9}\right)\right]_{-4}^{9}$$

$$= \left(3\sqrt[3]{(2\times 9+9)}\right) - 3\sqrt[3]{(2\times(-4)+9)}$$

$$= \left(3\times\sqrt[3]{27}\right) - 3\times\sqrt[3]{1} = 9 - 3 = 6 \text{ units}^2$$

Candidate 28 evidence — question 15



Candidate 29 evidence — question 15