Practice PaperA **Marking Scheme - Paper I Section A**

1.

$$\frac{d}{dx}2x^2-\frac{3}{5}x^{-1}$$
$$=4x+\frac{3}{5}x^{-2}$$

Answer: C

2.

$$y=2x^3-5x+1$$
$$\frac{dy}{dx}=6x^2-5$$

when $x=3$

$$\frac{dy}{dx}6(3)^2-5=49$$

Answer: B

3.

$$\sin(x+y)$$
$$=\sin x\cos y+\cos x\sin y$$
$$=\frac{3}{5}\times\frac{5}{13}+\frac{4}{5}\times\frac{12}{13}$$
$$=\frac{15}{65}+\frac{48}{65}$$
$$=\frac{63}{65}$$

Answer: D

4.

$$U_1=3a-2$$
$$U_2=a(3a-2)-2$$
$$=3a^2-2a-2$$

Answer: D

5.

$$k=\sqrt{4^2+(-1)^2}=\sqrt{17}$$
$$\tan\alpha=\frac{\sin\alpha}{\cos\alpha}=\frac{4}{-1}$$

Quadrant II

* S	A *
* T	C

Answer: A

6.

$$L=\frac{7}{1-0\cdot6}=\frac{7}{0\cdot4}$$
$$=7\times\frac{10}{4}=\frac{70}{4}=\frac{35}{2}$$

Answer: B

7. ***Answer: D***

8.

$$2\sin(x+\frac{\pi}{3})$$
$$=2\sin x\cos\frac{\pi}{3}+2\cos x\sin\frac{\pi}{3}$$
$$=2\times\sin x\times\frac{1}{2}+2\times\cos x\times\frac{\sqrt{3}}{2}$$
$$=\sin x+\sqrt{3}\cos x$$

Answer: D

9.

$$m_{CA}=\frac{1}{4}$$
$$m_{alt}=-4$$
$$y-11+-4(x-5)$$
$$y-11=-4x+20$$
$$y+4x-31=0$$

Answer: B

10. Scalar product = 0 for perpendicular vectors.

$$2-3y+10=0$$
$$-3y+12=0$$
$$-3y=-12$$
$$y=4$$

Answer: B

11. $(3x+2)(4x-1)=12x^2+5x-2$

$$\int 12x^2+5x-2=\frac{12x^3}{3}+\frac{5x^2}{2}-2x+C$$
$$=4x^3+\frac{5}{2}x^2-2x+C$$

Answer: B

12. $\boldsymbol{a}\,.\,\boldsymbol{b}=0-8+0=-8$

$$|\,a\,|=\sqrt{4+16+4}=\sqrt{24}$$
$$|\,b\,|=\sqrt{4}=2 \qquad 1$$
$$\cos x^\circ \frac{-8}{2\sqrt{24}}=\frac{-8}{4\sqrt{6}}=\frac{-2}{\sqrt{6}}$$

Answer: A

13. $(x+2)^2+(y-7)^2=r^2$

$$r^2=(-2-1)^2+(7-3)^2$$
$$=9+16=25$$

Answer: A

14.
$$4(x^2+4x)-7$$
$$=4[(x+2)^2-4]-7$$
$$=4(x+2)^2-16-7$$
$$=4(x+2)^2-23$$

Answer: D

15.
$$f(g(x))=\frac{1}{(-3x)^2}$$
$$=\frac{1}{9x^2}$$

Answer: C

16. Centre (2, 3) P(3, 1)

$$m_{CP}=\frac{3-1}{2-3}=-2$$
$$m_{\tan}=\frac{1}{2}$$

Answer: B

17.
$$-4\cos 3x\times\frac{1}{3}+C$$
$$=-\frac{4}{3}\cos 3x+C$$

Answer: C

18.
$$f(3)=2(3)^2-1=17$$
$$g(17)=6-17=-11$$

Answer: A

19. $\mathrm{A}(3,-2))$

$\mathrm{B}(1,-3)$

$$\mathrm{AB}=\sqrt{(3-1)^2+(-2-(-3))^2}$$
$$=\sqrt{4+1}=\sqrt{5}$$

Answer: B

20.
$$\overrightarrow{\mathrm{PQ}}=\begin{pmatrix}2\\-5\\4\end{pmatrix}-\begin{pmatrix}-1\\-8\\-2\end{pmatrix}=\begin{pmatrix}3\\3\\6\end{pmatrix}$$
$$\overrightarrow{\mathrm{QR}}=\begin{pmatrix}3\\-4\\6\end{pmatrix}-\begin{pmatrix}2\\-5\\4\end{pmatrix}=\begin{pmatrix}1\\1\\2\end{pmatrix}$$

$\overrightarrow{\mathrm{PQ}}=2\overrightarrow{\mathrm{QR}}$

so collinear

ratio = 3 : 1

only statement (1) is correct

Answer: B

Practice Paper A - Paper 1 Section B **Marking Scheme**

	Give 1 mark for each •	Illustration(s) for awarding each mark
21a	**ans:** ***proof*** **1 mark**	
	•[1] explain why limit exists	•[1] $-1 < a < 1$
b	**ans: L = 15** **2 marks**	
	•[1] for using limit formula or equivalent	•[1] $L = \frac{b}{1-a}$
	•[2] finds limit	•[2] $L = 15$
c	**ans: *n* = 3** **3 marks**	
	•[1] for substitution	•[1] $U_1 = 0 \cdot 8(10) + 3 = 11$
	•[2] starts to solve	•[2] $U_3 = 12 \cdot 44 \quad \therefore 15 - 12 \cdot 44 = 2 \cdot 56$
	•[3] finds value for *n*	•[3] $n = 3$
22a	**ans:** $4\sqrt{10}$ **3 marks**	
	•[1] finding the centre of circle	•[1] (15,6)
	•[2] finding the centre of circle	•[2] (3,2)
	•[3] find distance using distance form. or pyth	•[3] distance = $4\sqrt{10}$
b	**ans:** d = $\sqrt{10}$ **4 marks**	
	•[1] find radius of circle	•[1] $r_1 = \sqrt{40} = 2\sqrt{10}$
	•[2] find radius of circle	•[2] $r_2 = \sqrt{10}$
	•[3] calculate distance	•[3] $\sqrt{10} + 2\sqrt{10} + \text{gap} = 4\sqrt{10}$ (or equiv.)
	•[4] short distance	•[4] d = $\sqrt{10}$ = the radius of the smaller circle

	Give 1 mark for each •	Illustration(s) for awarding each mark
23a	**ans:** $H(4, 1, -1)$ **3 marks**	
	•[1] find $\overrightarrow{EF}$	•[1] $\overrightarrow{EF} = \begin{pmatrix} 2 \\ 1 \\ -1 \end{pmatrix}$
	•[2] starts to solve to find h	•[2] $\begin{pmatrix} 6 \\ 3 \\ -3 \end{pmatrix} = \underset{\sim}{h} - \begin{pmatrix} -2 \\ -2 \\ 2 \end{pmatrix}$
	•[3] finds h	•[3] $\underset{\sim}{h} = \begin{pmatrix} 4 \\ 1 \\ -1 \end{pmatrix} = H(4,1,-1)$
b	**ans:** mag. $= \sqrt{30}$ **2 marks**	
	•[1] find $\overrightarrow{EH}$	•[1] $\underset{\sim}{h} - \underset{\sim}{e} = \begin{pmatrix} 5 \\ -1 \\ -2 \end{pmatrix}$
	•[2] calculates magnitude	•[2] mag. $= \sqrt{30}$
24	**ans: angle BDG** $= 44 \cdot 3^\circ$ **6 marks**	
	•[1] rearranging to equal zero and factorise	•[1] evidence
	•[2] correct replacement	•[2] $2\cos^2 x^\circ - 1$
	•[3] for factorising	•[3] $3(2\cos^2 x^\circ - 3\cos x^\circ - 5) = 0$
	•[4] factorising	•[4] $\cos x^\circ = \frac{5}{2}$ *or* $\cos x^\circ = -1$
	•[5] for rejecting for no solution	•[5] $\cos x^\circ = \frac{5}{2}$
	•[6] for solving $\cos x^\circ = -1$	•[6] $x = 180^\circ$
25a	**ans:** $y = 2x^2$ **4 marks**	
	•[1] start to solve equation	•[1] $2\log_x y - \log_x 2y = 2$
	•[2] continues to solve equation	•[2] $\log_x y^2 - \log_2 2y = 2$
	•[3] rearranges equation	•[3] $\log_x \frac{y^2}{2y} = 2 \quad \Rightarrow \quad \log_x \frac{1}{2}y = 2$
	•[4] solve for y	•[4] $x^2 = \frac{1}{2}y \Rightarrow y = 2x^2$
b	**ans:** $y = 8$ **2 marks**	
	•[1] substitute into equation	•1 $y = 2(\frac{1}{4}y)^2$
	•[2] solve for y	•[2] $y = \frac{1}{8}y^2 \quad \Rightarrow$ ans. $y = 8$

Total 30 marks

Practice Paper A - Paper 2 **Marking Scheme**

	Give 1 mark for each •	Illustration(s) for awarding each mark
1a	**ans: $y - x = 2$** **3 marks**	
	•[1] finds midpoint of QR	•[1] midpoint QR- $M(4\frac{1}{4}, 6\frac{1}{4})$
	•[2] establishes gradient of PM	•[2] $m_{PM} = 1$
	•[3] substitutes in general equation	•[3] $y + 5 = 1(x + 7)$
b	**ans: D(4,1)** **4 marks**	
	•[1] find gradient of PR	•[1] $m_{PR} = \frac{1}{2}$
	•[2] finds gradient of the altitude	•[2] $m_{alt.} = -2$
	•[3] choses correct point and gradient	•[3] $y - 10 = -2(x - \frac{1}{2})$
	•[4] correct equation	•[4] $y + 2x = 11$
c	**ans: T(3,5)** **3 marks**	
	•[1] knows to solve system	•[1] $\left.\begin{array}{l} y = x + 2 \\ y + 2x = 11 \end{array}\right\}$
	•[2] finds first coordinate	•[2] eg. $x = 3$
	•[3] finds point of intersection	•[3] T(3, 5)
2a	**ans: proof; T(6, 3)** **5 marks**	
	•[1] knows to solve as a system	•[1] evidence
	•[2] for substitution	•[2] $x^2 + (15 - 2x)^2 - 4x - 2(15 - 2x) - 15 = 0$
	•[3] for findig x coordinate	•[3] $5(x - 6)(x - 6) = 0 \quad \therefore \quad x = 6$
	•[4] for finding y coordinate	•[4] y - coordinate - y = 3 then T(6,3)
	•[5] for stating point represents a tangent	•[5] $b^2 - 4ac = 0, etc.$ or equivalent
b	**ans: k = 10** **3 marks**	
	•[1] finds value for k	•[1] $k = 10$
c	**ans: $(x - 6)^2 + (y + 2)^2 = 25$** **4 marks**	
	•[1] realise CP is a diameter	•[1] *evidence*
	•[2] establish centre	•[2] (6, -2)
	•[3] calculate r *or* r^2	•[3] $r^2 = 25$
	•[4] equation of circle	•[4] $(x - 6)^2 + (y + 2)^2 = 25$

	Give 1 mark for each •	Illustration(s) for awarding each mark
3a	**ans:** A(3,54). B(4,0) **7 marks**	
	•[1] sets equal to zero	•[1] $8x^3 - 2x^4 = 0$
	•[2] finds x values	•[2] $x = 0$ or $x = 4$
	•[3] finds coordinates for B	•[3] B(4,0)
	•[4] differentiates	•[4] $dy/dx = 24x^2 - 8x^3$
	•[5] sets differential equal to zero	•[5] $24x^2 - 8x^3 = 0$
	•[6] finds x values	•[6] $x = 0$ or $x = 3$
	•[7] use $x = 3$ and finds y	•[7] A(3,54)
b	**ans:** $8y = 40x - 13$ **5 marks**	
	•[1] use derivative to find m of tangent	•[1] evidence
	•[2] sub $x = \frac{1}{2}$ into dy/dx	•[2] $m_{\tan} = 5$
	•[3] sub. $x = \frac{1}{2}$ into " y = "	•[3] $(\frac{1}{2}, \frac{7}{8})$
	•[4] use y - b = m(x - a) (or equiv.)	•[4] evidence
	•[5] equation of line	•[5] $8y = 40x - 13$ or equivalent
4a	**ans:** B(8,-2,-3), D(0,2,-3), G(8,2,3) **3 marks**	
	•[1] finds coordinates of B	•[1] B(8,-2,-3)
	•[2] finds coordinates of D	•[2] D(0,2,-3)
	•[3] finds coordinates of G	•[3] G(8,2,3)
b	**ans: angle BDG** = $44 \cdot 3^\circ$ **6 marks**	
	•[1] selecting suitable vectors i.e. $\vec{DB}$ & $\vec{DG}$	•[1] evidence
	•[2] calculating vectors	•[2] $\vec{DB} = \begin{pmatrix} 8 \\ -4 \\ 0 \end{pmatrix}$ *and* $\vec{DG} = \begin{pmatrix} 8 \\ 0 \\ 6 \end{pmatrix}$
	•[3] scalar product	•[3] $\vec{DB}.\vec{DG} = 64$
	•[4] finding both magnitudes	•[4] $4\sqrt{5}$ *and* 10
	•[5] for scalar product	•[5] $\cos\theta = \frac{64}{40\sqrt{5}}$ (or equivalent)
	•[6] calculate angle	•[6] angle BDG = $44 \cdot 3^\circ$

	Give 1 mark for each •	Illustration(s) for awarding each mark
5a	**ans: A(0,8) 1 mark**	
	•[1] finds coordinates of A	•[1] A(0,8)
b	**ans: proof 3 marks**	
	•[1] differentiate	•[1] $m = \frac{dy}{dx} = 3x^2 - 4x - 4$
	•[2] find gradient	•[2] $x = 0 \quad , \quad m = -4$
	•[3] find equation	•[3] $x = 0 \quad , \quad m = -4$
c	**ans:** $Area = 1\frac{1}{3}\ units^2$ **5 marks**	
	•[1] set up integral	•[1] evidence
	•[2] for limits	•[2] $Area = \int_0^2 \left((8-4x)-(x^3-2x^2-4x+8)\right)dx$
	•[3] for area	•[3] $Area = \left[\frac{2x^3}{3} - \frac{x^4}{4}\right]_0^2$
	•[4] evaluating area	•[4] $Area = (1\frac{6}{3} - 4) - (0)$
	•[5] calculates area	•[5] $Area = 1\frac{1}{3}\ units^2$
d	**ans:** $133\frac{1}{3}\ cm^2$ **1 mark**	
	•[1] calculates area in square centimetres	•[1] $1\frac{1}{3} \times 100 = 133\frac{1}{3}\ cm^2$
e	**ans: 80 litres 2 marks**	
	•[1] calculates volume	•[1] $V = 133\frac{1}{3} \times 600$
	•[2] converts to litres	•[2] $V = 80000\ cm^3 = 80\ litres$
6a	**ans:** $L = 2\cos(36t - 60)^\circ + 2$ **4 marks**	
	•[1] calculate R	•[1] $R = 2$
	•[2] calculate tan α	•[2] $\tan\alpha = \sqrt{3}/1$
	•[3] realising 1st Quad	•[3] $\alpha = 60^\circ$
	•[4] find wave form	•[4] $L = 2\cos(36t - 60)^\circ + 2$
b	**ans :** $t = 3{\cdot}8$ secs **3 marks**	
	•[1] set up equation	•[1] $2\cos(36t - 60)^\circ + 2 = 2{\cdot}5$
	•[2] rearrange equation	•[2] $36t - 60 = 75{\cdot}5$
	•[3] find value for t	•[3] $t = 3{\cdot}8\ \text{seconds}$

Total 60 marks