

Question number	Scheme	Marks
1.	<p>(a) $2+1-5+c=0$ or $-2+c=0$ $\underline{c=2}$</p> <p>(b) $f(x) = (x-1)(2x^2+3x-2)$ $(x-1)$ <div style="text-align:right">division</div> $= \dots \underline{(2x-1)(x+2)}$</p> <p>(c) $f\left(\frac{3}{2}\right) = 2 \times \frac{27}{8} + \frac{9}{4} - \frac{15}{2} + c$ Remainder = $c + 1.5 = \underline{3.5}$ ft their c</p>	<p>M1 A1 (2)</p> <p>B1 M1 M1 A1 (4)</p> <p>M1 A1ft (2)</p> <p>Total 8 marks</p>
2.	<p>(a) $(1+px)^9 = 1+9px; +\binom{9}{2}(px)^2$</p> <p>(b) $9p=36$, so $\underline{p=4}$ $q = \frac{9 \times 8}{2} p^2$ or $36p^2$ or $36p$ if that follows from their (a) So $\underline{q=576}$</p>	<p>B1 B1 (2)</p> <p>M1 A1 M1 A1cao (4)</p> <p>Total 6 marks</p>
3.	<p>(a) $(AB)^2 = (4-3)^2 + (5)^2$ [= 26] $\underline{AB = \sqrt{26}}$</p> <p>(b) $p = \left(\frac{4+3}{2}, \frac{5}{2}\right)$ $= \underline{\left(\frac{7}{2}, \frac{5}{2}\right)}$</p> <p>(c) $(x-x_p)^2 + (y-y_p)^2 = \left(\frac{AB}{2}\right)^2$ LHS RHS $(x-3.5)^2 + (y-2.5)^2 = 6.5$ oe</p>	<p>M1 A1 (2)</p> <p>M1 A1 (2)</p> <p>M1 M1 A1 c.a.o (3)</p> <p>Total 7 marks</p>

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4.	<p>(a) $\frac{a}{1-r} = 480$ $\frac{120}{1-r} = 480 \Rightarrow 120 = 480(1-r)$ $1-r = \frac{1}{4} \Rightarrow \underline{r = \frac{3}{4}} \quad *$</p> <p>(b) $u_5 = 120 \times (\frac{3}{4})^4 [= 37.96875]$ $u_6 = 120 \times (\frac{3}{4})^5 [= 28.4765625]$ Difference = <u>9.49</u> (allow \pm)</p> <p>(c) $S_7 = \frac{120(1-(0.75)^7)}{1-0.75}$ $= 415.9277\dots$ (AWRT) <u>416</u></p> <p>(d) $\frac{120(1-(0.75)^n)}{1-0.75} > 300$ $1-(0.75)^n > \frac{300}{480}$ (or better) $n > \frac{\log(0.375)}{\log(0.75)}$ (=3.409...) <u>n = 4</u></p>	<p>M1 M1 A1 cso (3) M1 A1 (2) M1 A1 (2) M1 A1 M1 A1 M1 A1 A1 M1 A1 M1 A1 A1 M1 dM1 A1ft (3) Total 11 marks</p>
5.	<p>(a) $\cos \hat{A}OB = \frac{5^2 + 5^2 - 6^2}{2 \times 5 \times 5}$ or $\sin \theta = \frac{3}{5}$ with use of $\cos 2\theta = 1 - 2\sin^2 \theta$ attempted $= \frac{7}{25} \quad *$</p> <p>(b) $\hat{A}OB = 1.2870022\dots$ radians 1.287 or better</p> <p>(c) Sector = $\frac{1}{2} \times 5^2 \times (b)$, = 16.087... (AWRT) <u>16.1</u></p> <p>(d) Triangle = $\frac{1}{2} \times 5^2 \times \sin(b)$ or $\frac{1}{2} \times 6 \times \sqrt{5^2 - 3^2}$ Segment = (their sector) – their triangle = (sector from c) – 12 = (AWRT) <u>4.1</u> (ft their part(c))</p>	<p>M1 A1 cso (2) B1 (1) M1 A1 (2) M1 dM1 A1ft (3) Total 8 marks</p>

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6.	<p>(a) $t = 15 \quad 25 \quad 30$ $v = \underline{3.80 \quad 9.72 \quad 15.37}$</p> <p>(b) $S \approx \frac{1}{2} \times 5; [0 + 15.37 + 2(1.22 + 2.28 + 3.80 + 6.11 + 9.72)]$ $= \frac{5}{2}[61.63] = 154.075 = \text{AWRT } \underline{154}$</p>	<p>B1 B1 B1 (3)</p> <p>B1 [M1]</p> <p>A1 (3)</p> <p>Total 6 marks</p>

7.	<p>(a) $\frac{dy}{dx} = 6x^2 - 10x - 4$</p> <p>(b) $6x^2 - 10x - 4 = 0$ $2(3x + 1)(x - 2) [=0]$ $\underline{x = 2 \text{ or } -\frac{1}{3}}$ (both x values)</p> <p>Points are $(2, \underline{-10})$ and $(-\frac{1}{3}, 2\frac{19}{27} \text{ or } \frac{73}{27} \text{ or } 2.70 \text{ or better})$ (both y values)</p> <p>(c) $\frac{d^2y}{dx^2} = 12x - 10$</p> <p>(d) $x = 2 \Rightarrow \frac{d^2y}{dx^2} (=14) \geq 0 \therefore [(2, -10)]$ is a <u>Min</u></p> <p>$x = -\frac{1}{3} \Rightarrow \frac{d^2y}{dx^2} (= -14) \leq 0 \therefore [(-\frac{1}{3}, \frac{73}{27})]$ is a <u>Max</u></p>	<p>M1 A1 (2)</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>A1 (4)</p> <p>M1 A1 (2)</p> <p>M1</p> <p>A1 (2)</p> <p>Total 10 marks</p>
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8.	(a) $\sin(\theta + 30) = \frac{3}{5}$ $\theta + 30 = 36.9$ or $\theta = 143.1$ $\theta = \underline{6.9, 113.1}$	$(\frac{3}{5}$ on RHS) B1 $(\alpha = \text{AWRT } 37)$ B1 $(180 - \alpha)$ M1 A1cao (4)
	(b) $\tan \theta = \pm 2$ or $\sin \theta = \pm \frac{2}{\sqrt{5}}$ or $\cos \theta = \pm \frac{1}{\sqrt{5}}$ $(\tan \theta = 2 \Rightarrow) \theta = \underline{63.4}$ $(\beta = \text{AWRT } 63.4)$ or $\underline{243.4}$ $(180 + \beta)$ $(\tan \theta = -2 \Rightarrow) \theta = \underline{116.6}$ $(180 - \beta)$ or $\underline{296.6}$ $(180 + \text{their } 116.6)$	B1 B1 M1 M1 M1 (5) Total 9 marks

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9.	<p>(a) $\frac{3}{2} = -2x^2 + 4x$</p> <p>$4x^2 - 8x + 3 = 0$</p> <p>$(2x-1)(2x-3) = 0$</p> <p><u>$x = \frac{1}{2}, \frac{3}{2}$</u></p> <p>(b) Area of $R = \int_{\frac{1}{2}}^{\frac{3}{2}} (-2x^2 + 4x) dx - \frac{3}{2}$ (for $-\frac{3}{2}$)</p> <p>$\int (-2x^2 + 4x) dx = \left[-\frac{2}{3}x^3 + 2x^2 \right]$ (Allow $\pm[]$, accept $\frac{4}{2}x^2$)</p> <p>$\int_{\frac{1}{2}}^{\frac{3}{2}} (-2x^2 + 4x) dx = \left(-\frac{2}{3} \times \frac{3^3}{2^3} + 2 \times \frac{3^2}{2^2} \right) - \left(-\frac{2}{3} \times \frac{1}{2^3} + 2 \times \frac{1}{2^2} \right)$</p> <p>$\left(= \frac{11}{6} \right)$</p> <p>Area of $R = \frac{11}{6} - \frac{3}{2} = \frac{1}{3}$ (Accept exact equivalent but not 0.33...)</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1 (4)</p> <p>B1</p> <p>M1 [A1]</p> <p>M1 M1</p> <p>A1 cao (6)</p> <p>Total 10 marks</p>