

Question Number	Scheme	Marks
4. (a)	$(270^\circ, 0)$	B1 (1)
(b)	$(-180^\circ, -4)$	B1, B1 (2)
(c)(i)	100	B1
(ii)	4	B1
(iii)	7	B1
		(3)
		(6 marks)

Question Number	Scheme	Marks
10 (a)	$f'(x) = 4\sqrt{x^3} + \frac{k}{x^2} = 4x^{\frac{3}{2}} + kx^{-2}$ $f''(x) = 6x^{\frac{1}{2}} - 2kx^{-3}$ $f''(2) = 6\sqrt{2} - 2k \times \frac{1}{8} = 0 \Rightarrow k = 24\sqrt{2}$	M1, A1 dM1, A1 (4)
(b)	$f'(x) = 4x^{\frac{3}{2}} + kx^{-2} \Rightarrow f(x) = 4 \times \frac{2}{5} x^{\frac{5}{2}} - kx^{-1} (+c)$ Uses $P(2, 8\sqrt{2}) \Rightarrow 8\sqrt{2} = 4 \times \frac{2}{5} \times 2^{\frac{5}{2}} - \frac{k}{2} + c \Rightarrow c = p\sqrt{2}$ $f(x) = \frac{8}{5} x^{\frac{5}{2}} - \frac{24\sqrt{2}}{x} + \frac{68}{5} \sqrt{2}$	M1, A1 ft dM1 A1 (4)
		(8 marks)

Question Number	Scheme	Marks
3.(a)	$\left(\frac{dy}{dx}\right) = 3x^2 + \frac{48}{\sqrt{x}}$	M1, A1, A1 (3)
(b)	$\left(\frac{d^2y}{dx^2}\right) = 6x - \frac{24}{x^{\frac{3}{2}}}$ $\Rightarrow x^{\frac{5}{2}} = \dots \quad x = 2^{\frac{4}{5}}$	M1 dM1 A1 (3)
		(6 marks)

Question Number	Scheme	Marks
6.	$(x+5)(3x+2)(2x-5) = (3x^2 + 17x + 10)(2x-5) = \dots$	M1
	$= 6x^3 - 15x^2 + 34x^2 - 85x + 20x - 50$ $\left(= 6x^3 + 19x^2 - 65x - 50 \right)$	A1
	$6x^3 + 19x^2 - 65x - 50 = 3x^2 - 33x - 50$ $\Rightarrow 6x^3 + 16x^2 - 32x = 0$	dM1
	$2x(3x-4)(x+4) = 0$	ddM1
	$x = -4, 0, \frac{4}{3}$	A1
		(5)
		(5 marks)

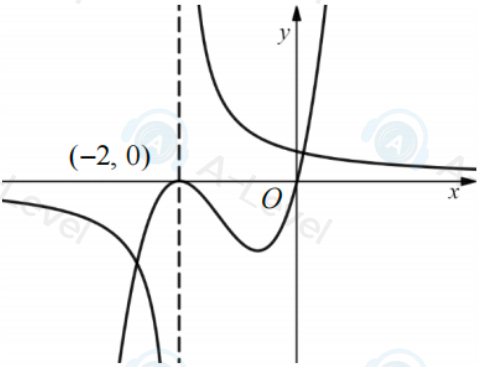
Question Number	Scheme	Marks
9(a)	$(A) - 3$	B1
		(1)
(b)	$y = 3$	B1
	eg $x = 30 + 5 \times 180$ or $x = 210 + 720$ or $x = 180 + 2 \times 360 + 30$	M1
	$x = 930$	A1
		(3)
		Total 4

Question	Scheme	Marks
2(a)	$2x + 2y = 350$	B1
		(1)
(b)	E.g. $xy = 7350$, $x \times y = 7350$	B1
		(1)
(c)	$x(175 - x) = 7350$ or $(175 - y)y = 7350$	M1
	E.g. $x^2 - 175x + 7350 = 0 \Rightarrow (x - 70)(x - 105) = 0 \Rightarrow x = \dots$	dM1
	$x = 70$ or 105	A1
	$(x > y \Rightarrow) x = 105, y = 70$	A1
		(4)
		(6 marks)

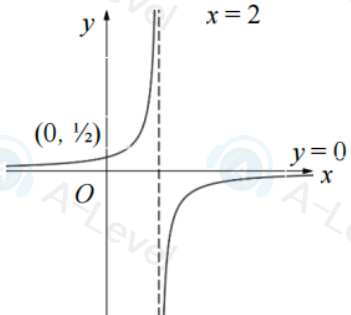
Question Number	Scheme	Marks
8(a)	$m = \frac{18-0}{2--3}$	M1
	$y-18 = \frac{18}{5}(x-2)$ or e.g. $y = \frac{18}{5}(x+3)$ or $18 = \frac{18}{5}(2)+c \Rightarrow c = \dots$ or e.g. $0 = \frac{18}{5}(-3)+c \Rightarrow c = \dots$	dM1
	$y = \frac{18}{5}x + \frac{54}{5}$	A1
		(3)
(b)	Examples: $y = ax^2 + bx - 6$ $y = (x+3)(px+q)$ $y = ax^2 + bx + c, (0, -6), (2, 18), (-3, 0) \Rightarrow a = \dots$ or $b = \dots$ or $c = \dots$ NB $a = \frac{14}{5}, b = \frac{32}{5}, c = -6$	M1
	Full method to find all constants. E.g. Solves $9a - 3b - 6 = 0$ and $4a + 2b - 6 = 18 \Rightarrow a = \dots, b = \dots$	dM1
	Either $a = \frac{14}{5}$ or $b = \frac{32}{5}$	A1
	$y = \frac{14}{5}x^2 + \frac{32}{5}x - 6$	A1
		(4)
(c)	$\frac{14}{5}x^2 + \frac{32}{5}x - 6 < y < \frac{18}{5}x + \frac{54}{5}, x < 0$	M1 A1ft
		(2)
		(9 marks)

Question	Scheme	Marks
11(a)	$x = \frac{5\pi}{2}$ or $y = 12$	B1
	$x = \frac{5\pi}{2}$ and $y = 12$	B1
		(2)
(b)	$x = \frac{3\pi}{2}$ or $y = -21$	B1
	$x = \frac{3\pi}{2}$ and $y = -21$	B1
		(2)
(c)(i) (ii)	$(A =) -12$	B1
	$(B =) \frac{5\pi}{4}$	B1
		(2)
		Total 6

Question Number	Scheme	Marks
7.(a)	Attempts to use $\frac{1}{2}r^2\theta$ with $r=6$ and any allowable angle θ Full method to find area $\frac{1}{2} \times 6^2 \times (2\pi - 0.7)$ or $\pi \times 6^2 - \frac{1}{2} \times 6^2 \times 0.7$ $= 100.5 \text{ cm}^2$ (awrt)	M1 M1 A1 (3)
(b)	Attempts $\frac{\sin \angle ADO}{6} = \frac{\sin 0.7}{5} \Rightarrow \sin \angle ADO = 0.77\dots$ $\angle ADO = 2.258$ (awrt)	M1 A1 A1 (3)
(c)	Attempts arc length $ABC = 6 \times (2\pi - 0.7)$ Attempts length OD $\frac{\sin(\pi - 0.7 - "2.258")}{OD} = \frac{\sin 0.7}{5} \Rightarrow OD = \dots$ Full method to find perimeter = "33.50" + 5 + 6 - "1.42" $= 43.1 \text{ cm}$	33.50 1.42 M1 M1 ddM1 A1 (4) (10 marks)

Question Number	Scheme	Marks
4a	$x = -2$	B1 (1)
b	$x^3 + 4x^2 + 4x = x(x+2)^2$	M1A1 (2)
c		B1B1B1 (3)
d	2 as the graphs intersect (each other) twice (since $(x+2)(x^3 + 4x^2 + 4x) = 1$ is the same as $x^3 + 4x^2 + 4x = \frac{1}{x+2}$)	B1 (1)
		(7 marks)

Question Number	Scheme	Marks
7(a)	$4 \times -2 \times -9 = 72$ $p = "72" - 50$	M1
	$(p =) 22$	A1
		(2)
(b)	$(q =) -4, 2, 4.5$	B1B1
		(2)
(c)	$f(x) = (x+4)(x-2)(2x-9)$ $f(x) = (x^2 + 2x - 8)(2x - 9) = \dots x^3 \pm \dots x^2 \pm \dots x (\pm \dots)$	M1
	$= 2x^3 - 5x^2 - 34x (+72)$	A1
	$(f'(x) =) 6x^2 - 10x - 34$	M1A1
		(4)
(d)	$"6x^2 - 10x - 34" = -18$ $"6x^2 - 10x - 16" = 0 \Rightarrow x = \dots \left(-1, \frac{8}{3}\right)$	M1
	$-1 < x < \frac{8}{3}$	dM1A1
		(3)
		Total 11

Question	Scheme	Marks
7(a)	 B1 Negative reciprocal shape B1 Intercept at $(0, \frac{1}{2})$ B1 $x = 2, y = 0$	B1B1B1
		(3)
(b)	$4x + k = \frac{1}{2-x} \Rightarrow (4x+k)(2-x) = 1 \Rightarrow 8x + 2k - 4x^2 - kx - 1 (=0) \text{ oe}$ $4x^2 + (k-8)x + 1 - 2k = 0$ $a = 4, b = k-8, c = 1-2k \quad \text{or} \quad a = -4, b = 8-k, c = 2k-1$ $(k-8)^2 - 4 \times 4(1-2k) (>0) \text{ oe}$ $k^2 - 16k + 64 - 16 + 32k > 0 \Rightarrow k^2 + 16k + 48 > 0^*$	M1 A1 M1 A1*
		(4)
(c)	$k^2 + 16k + 48 = 0 \Rightarrow (k+12)(k+4) = 0 \Rightarrow k = \dots$ $k = -12, -4$ $k < -12 \text{ or } k > -4$	M1 A1 M1A1
		(4)
		(11 marks)

Question Number	Scheme	Marks
10(a)	$m = \frac{4}{5}$	B1
	$y + 3 = \frac{4}{5}(x - 4) \text{ or } -3 = \frac{4}{5} \times 4 + c \Rightarrow c = \dots$	M1
	$y = \frac{4}{5}x - \frac{31}{5}$	A1
		(3)
(b)	$f'(4) = \frac{4}{5} \Rightarrow \frac{k\sqrt{4}(4-3)}{5} = \frac{4}{5} \Rightarrow k = \dots$	M1
	$k = 2$	A1
		(2)
(c)	$(f'(x) =) \frac{2\sqrt{x}(x-3)}{5} = \frac{2x^{\frac{3}{2}}}{5} - \frac{6x^{\frac{1}{2}}}{5}$	M1
	$(f(x) =) \frac{4x^{\frac{5}{2}}}{25} - \frac{4x^{\frac{3}{2}}}{5} (+c)$	M1 A1ft
	$x = 4, y = -3 \Rightarrow -3 = \frac{4(4)^{\frac{5}{2}}}{25} - \frac{4(4)^{\frac{3}{2}}}{5} + c \Rightarrow c = \left(-\frac{43}{25}\right)$	ddM1
	$(f(x) =) \frac{4x^{\frac{5}{2}}}{25} - \frac{4x^{\frac{3}{2}}}{5} - \frac{43}{25}$	A1
		(5)
		(10 marks)