Question Number	Scheme	Marks
1. (a)	$y = 2x^3 - 5x^2 - \frac{3}{2x} + 7 \Rightarrow \frac{dy}{dx} = 6x^2 - 10x + \frac{3}{2x^2}$	M1 A1 A1 **(3)**
(b)	$x = \frac{1}{2} \Rightarrow y = 3$	B1
	Substitutes $x = \frac{1}{2}$ into their $\frac{dy}{dx} = 6x^2 - 10x + \frac{3}{2x^2} = ... \left(= \frac{5}{2}\right)$	M1
	Uses the perpendicular gradient rule Eg. $\frac{5}{2} \rightarrow -\frac{2}{5}$	dM1
	Attempts the equation of the normal at P $y - 3 = -\frac{2}{5}\left(x - \frac{1}{2}\right)$	M1
	$2x + 5y - 16 = 0$ oe	A1 **(5)** **(8 marks)**

Question Number	Scheme	Marks
5 (a)	Attempts $r\theta = 5 \times 1.2$	M1
	Perimeter $= 5 + 5 + 6 = 16$ (km)	A1 **(2)**
(b)	Attempts $\frac{1}{2} r^2 \theta = \frac{1}{2} \times 5^2 \times 1.2$	M1
	Area $AOP = \frac{1}{4} \times \left(\frac{1}{2} \times 5^2 \times 1.2\right) = 3.75 \text{ km}^2$ *	M1, A1* **(3)**
(c)	Sets $\frac{1}{2} \times 5 \times OP \times \sin 1.2 = 3.75 \Rightarrow OP = ...$	M1
	$OP = 1.6...$	A1
	$AP^2 = 5^2 + "1.6.."^2 - 2 \times 5 \times "1.6.." \times \cos 1.2$	M1
	$AP = 4.7\text{km}$ or 4700m	A1cso **(4)** **(9 marks)**

Question Number	Scheme	Marks
3.(a)	Attempts $\left(\frac{dy}{dx} =\right) 2x + 3$ at $x = 3$	M1
	At $x = 3$ gradient of tangent $= 9$	A1 **(2)**
(b)	$\left(y_Q =\right) (3+h)^2 + 3(3+h) - 2$	B1
	Gradient $PQ = \frac{(3+h)^2 + 3(3+h) - 2 - 16}{3+h-3} = \frac{9h + h^2}{h} = 9 + h$	M1 A1 **(3)**
(c)	States as $h \rightarrow 0$ Gradient $PQ \rightarrow 9$ = Gradient of tangent	B1 **(1)** **(6 marks)**

Question Number	Scheme	Marks
8 (a)	Attempts to use $S=r\theta \Rightarrow 9=OD\times 0.8 \Rightarrow OD=11.25$ or $\frac{45}{4}$	M1, A1
	$AO=\frac{5}{8}\times "11.25"=7.03\text{ m}$ *	A1*
		(3)
(b)	Attempts $A=7.03\times(2\pi-0.8)=(38.55)$	M1
	Attempts $9+2\times(11.25-7.03)+7.03\times\theta$	M1
	Perimeter = awrt 56.0 m	A1
		(3)
(c)	Attempts $\frac{1}{2}\times "11.25"^2\times 0.8=(50.625)$ OR $\frac{1}{2}\times 7.03^2\times(2\pi-0.8)=(135.4)$	M1
	Full method for area of platform = $\frac{1}{2}\times "11.25"^2\times 0.8+\frac{1}{2}\times 7.03^2\times(2\pi-0.8)$	M1
	=awrt 186 m^2	A1
		(3)
		(9 marks)