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
2(a)(i)		

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
10	$y=\frac{2}{3}x^3-25x-\frac{56}{x}+\frac{194}{3}$	
(a)	$\frac{dy}{dx}=2x^2-25+\frac{56}{x^2}$	M1, A1
	Finds $\left.\frac{dy}{dx}\right\|_{x=2}=2\times4-25+\frac{56}{4}=-3$	dM1
	Equation of tangent $y+8="-3"(x-2)\Rightarrow y=-3x-2$ *	ddM1, A1*
		(5)
(b)	Sets $2x^2-25+\frac{56}{x^2}=-3$	M1
	$x^4-11x^2+28=0$	dM1, A1
	$(x^2-4)(x^2-7)=0\Rightarrow x^2=..$	ddM1
	$x=\sqrt{7}$ only	A1
		(5)
		(10 marks)