Question Number	Scheme	Marks
10(a)	$m=\frac{4}{5}$	B1
	$y+3=\frac{4}{5}(x-4)$ or $-3=\frac{4}{5}\times 4+c\Rightarrow c=...$	M1
	$y=\frac{4}{5}x-\frac{31}{5}$	A1
		(3)
(b)	$f'(4)=\frac{4}{5}\Rightarrow\frac{k\sqrt{4}(4-3)}{5}=\frac{4}{5}\Rightarrow k=...$	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)

Question Number	Scheme	Marks
1.	$\int(2x-5)(3x+2)(2x+5)\,dx$	
	$(2x-5)(3x+2)(2x+5)=(6x^2-11x-10)(2x+5)=...$	M1
	$=12x^3+8x^2-75x-50$	A1
	$\int(2x-5)(3x+2)(2x+5)\,dx=3x^4+\frac{8}{3}x^3-\frac{75}{2}x^2-50x+c$	M1, A1ft, A1
		(5 marks)

Question Number	Scheme	Marks
	$y=\frac{1}{2}x^4-3+\frac{10}{x^2}$	
5(a)	$\left(\int \frac{1}{2}x^4-3+\frac{10}{x^2}\,dx=\right)\frac{1}{10}x^5-3x-\frac{10}{x}+c$	M1A1A1
		(3)
(b)(i)	$\left(\frac{dy}{dx}=\right)2x^3-\frac{20}{x^3}$	M1A1A1
		(3)
(b)(ii)	$2x^3-\frac{20}{x^3}=3\Rightarrow 2x^6-20=3x^3$	M1
	$2x^6-3x^3-20=0\Rightarrow\left(2x^3+5\right)\left(x^3-4\right)=0\Rightarrow x^3=...\Rightarrow x=...$ or e.g. $x^3=a\Rightarrow(2a+5)(a-4)=0\Rightarrow a=...\Rightarrow x^3=...\Rightarrow x=...$	dM1
	$\Rightarrow x=-\sqrt[3]{\frac{5}{2}},\quad \sqrt[3]{4}$	A1A1
		(4)
		(10 marks)

Question	Scheme	Marks
8(a)	$y=\frac{1}{4}x^3-8x^{-\frac{1}{2}}\Rightarrow\left(\frac{dy}{dx}=\right)\frac{1}{4}\times 3x^2-8\times-\frac{1}{2}x^{-\frac{3}{2}}$	**M1 A1**
	$\left.\frac{dy}{dx}\right\|_{x=4}=...\left(\frac{25}{2}\right)$	**M1**
	$y-12="\frac{25}{2}"\left(x-4\right)$	**dM1**
	$25x-2y-76=0$ oe e.g. $-25x+2y+76=0$	**A1**
		(5)

Question Number	Scheme	Marks
7.(a)	Attempts $\frac{dy}{dx}=4x$ at $x=2$	M1
	At $x=2$ gradient of tangent $=8$	A1 **(2)**
(b)	$\left(y_Q=\right)\ 2\left(2+h\right)^2+5$	B1
	Gradient $PQ=\frac{\text{their } y_Q-13}{2+h-2}$	M1
	$\left(=\frac{8h+2h^2}{h}\right)=8+2h$	A1 **(3)**
(c)	States as $h\to 0$ Gradient $PQ\to 8=$ Gradient of tangent	B1 **(1)**
		(6 marks)

Question Number	Scheme	Marks
10(a)	$m=\frac{4}{5}$	B1
	$y+3=\frac{4}{5}(x-4)$ or $-3=\frac{4}{5}\times 4+c\Rightarrow c=...$	M1
	$y=\frac{4}{5}x-\frac{31}{5}$	A1
		(3)
(b)	$f'(4)=\frac{4}{5}\Rightarrow\frac{k\sqrt{4}(4-3)}{5}=\frac{4}{5}\Rightarrow k=...$	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)

Question Number	Scheme	Marks
	$y=2x^{\frac{5}{2}}-4x+3$	
2. (a)	$\left\{\frac{dy}{dx}=\right\}5x^{\frac{3}{2}}-4$	M1, A1
		(2)
(b)	$5x^{\frac{3}{2}}-4=16\Rightarrow x^{\frac{3}{2}}=4$	M1, A1
	$\Rightarrow x=4^{\frac{2}{3}}=2^{\frac{4}{3}}\qquad\Rightarrow k=\frac{4}{3}$	A1
		(3)
		(5 marks)

Question Number	Scheme	Marks
8.(a)	Substitutes $x=4$ in $f'(4)=4\times2-2-\dfrac{8}{3\times4^{\frac{2}{2}}}=\left(\dfrac{35}{6}\right)$	M1
	Attempts to find the gradient of the perpendicular $=-\dfrac{6}{35}$	dM1
	Attempts the normal $y-1=-\dfrac{6}{35}\times(x-4)\Rightarrow 6x+35y-59=0$	M1A1
		(4)
(b)	$f'(x)=4x^{\frac{1}{2}}-2-\dfrac{8}{3x^{\frac{2}{2}}}\Rightarrow f(x)=\dfrac{8}{3}x^{\frac{3}{2}}-2x+\dfrac{8}{3x}(+c)$	M1 A1 A1
	$x=4, f(x)=1\Rightarrow\ 1=\dfrac{8}{3}\times8-8+\dfrac{2}{3}+c\Rightarrow c=\ldots(-13)$	dM1
	$f(x)=\dfrac{8}{3}x^{\frac{3}{2}}-2x+\dfrac{8}{3x}-13$	A1
		(5)
		(9 marks)

Question Number	Scheme	Marks
2(a)	$a=2$	B1
	$b=-3$	B1
		(2)
(b)	Any two term of $\displaystyle\int\frac{2x^3-3x^2-32x-15}{5\sqrt{x}}\,dx=\int\frac{2}{5}x^{\frac{5}{2}}-\frac{3}{5}x^{\frac{3}{2}}-\frac{32}{5}x^{\frac{1}{2}}-3x^{-\frac{1}{2}}\,dx$	M1A1
	$x^n\rightarrow x^{n+1}$	M1
	$\dfrac{4}{35}x^{\frac{7}{2}}-\dfrac{6}{25}x^{\frac{5}{2}}-\dfrac{64}{15}x^{\frac{3}{2}}-6x^{\frac{1}{2}}+c$	A1A1
		(5)
		(7 marks)

Question	Scheme	Marks
8(a)	$y=\dfrac{1}{4}x^3-8x^{-\frac{1}{2}}\Rightarrow\left(\dfrac{dy}{dx}=\right)\dfrac{1}{4}\times3x^2-8\times-\dfrac{1}{2}x^{-\frac{3}{2}}$	**M1 A1**
	$\left.\dfrac{dy}{dx}\right\|_{x=4}=\ldots\left(\dfrac{25}{2}\right)$	**M1**
	$y-12=\text{"}\dfrac{25}{2}\text{"}(x-4)$	**dM1**
	$25x-2y-76=0$ oe e.g. $-25x+2y+76=0$	**A1**
		(5)

Question Number	Scheme	Marks
8 (a) (i)	$x=4, f'(x)=10,\ f'(x)=3\sqrt{x}+kx^2 \Rightarrow 10=3\sqrt{4}+4^2k \Rightarrow k=\ldots$	M1
	$10=3\times2+k\times16 \Rightarrow k=\frac{1}{4}$ *	A1*
(ii)	$x=4, y=12$ on $y=10x+c \Rightarrow 12=10\times4+c$	M1
	$\Rightarrow c=-28$	A1
		(4)
(b)	$f''(x)=\frac{3}{2}x^{-\frac{1}{2}}+\frac{1}{2}x$	M1 A1ft
	$\{\Rightarrow f''(4)\}=\frac{11}{4}$	A1
		(3)
(c)	$f(x)=2x^{\frac{3}{2}}+\frac{1}{12}x^3+d$	M1, A1ft
	Uses $P(4,12) \Rightarrow 12=2\times8+\frac{1}{12}\times4^3+d \Rightarrow d=\ldots$	dM1
	$\{f(x)=\}2x^{\frac{3}{2}}+\frac{1}{12}x^3-\frac{28}{3}$	A1
		(4)
		(11 marks)

Question Number	Scheme	Marks
1.	$\int \frac{2}{3}x^3-\frac{1}{2x^3}+5\,dx=\frac{2}{3}\times\frac{x^4}{4}-\frac{1}{2}\times\frac{x^{-2}}{-2}+5x+c$	M1 A1
	$=\frac{1}{6}x^4+\frac{1}{4}x^{-2}+5x+c$	A1 A1
		(4 marks)

Question Number	Scheme	Marks
1a	$y=5x^3+\frac{3}{x^2}-7x=5x^3+3x^{-2}-7x$	
	$\left(\frac{dy}{dx}=\right)\ 15x^2-6x^{-3}-7$	M1A1A1
		(3)
b	$\left(\frac{d^2y}{dx^2}=\right)\ 30x+18x^{-4}$	M1A1
		(2)
		(5 marks)