Question Number	Scheme	Marks
		(2)
(b)	$f(x)=(2x+5)(x-3)^2=(2x+5)(x^2-6x+9)$	M1
	$=2x^3-12x^2+18x+5x^2-30x+45$	M1
	$=2x^3-7x^2-12x+45$	A1
		(3)
(c)	(i) $P(0,45)$	B1ft
	(ii) Gradient = -12	B1ft
		(2)
(d)	(i) $g(x)=(2(x-2)+5)(x-2-3)^2=(2x+1)(x-5)^2$	M1 A1
	(ii) 25	B1
		(3)
		(10 marks)

(a)

M1 For either $x \leqslant -\frac{5}{2}$ or $x=3$ Condone for this mark $x<-\frac{5}{2}$

A1 For both $x \leqslant -\frac{5}{2}$ and $x=3$ Accept answers given in set notation. Accept with "and" or "or" between – it is for both correct inequalities.

Note: Mark the final answer. Answers such as $-\frac{5}{2}\leqslant x\leqslant 3$ or $3\leqslant x\leqslant -\frac{5}{2}$ are M0A0.

(b)

M1 Attempts to multiply two of the brackets together, achieving x^2, x and constant terms.

M1 Multiplies the result by the third bracket to reach a four term cubic expression (not necessarily simplified).

A1 $2x^3-7x^2-12x+45$ Ignore any reference to "=0" or "<0" etc for this mark.

(c)(i)

B1ft $P(0,45)$ following through on their 'd' . Do not accept e.g. (45,0) or just 45.

(c)(ii)

B1 ft Gradient = -12 following through on their 'c'

(d)(i)

M1 Attempts to replace x with $(x-2)$ in $(2x+5)(x-3)^2$ or in their expansion of this.

Allow M1 for one correct bracket if no incorrect working is seen (bod). Condone invisible brackets

A1 $g(x)=(2x+1)(x-5)^2$ If substituting into the expand form, must factorise correctly to achieve A1.

(d)(ii)

B1 25 Accept (0,25).

Question Number	Scheme	Marks

11. (a)	Attempts $y-\frac{32}{3}=5(x-4)\Rightarrow y=5x-\frac{28}{3}$	M1 A1 **(2)**
(b)	$f''(x)=\frac{4}{\sqrt{x}}-3\Rightarrow f'(x)=8x^{\frac{1}{2}}-3x+k$	M1 A1
	Substitutes $x=4,\ f'(x)=5\Rightarrow k=1$	dM1 A1
	$f'(x)=8x^{\frac{1}{2}}-3x+1\Rightarrow f(x)=\frac{16}{3}x^{\frac{3}{2}}-\frac{3}{2}x^2+x+d$	dM1 A1
	Substitutes $x=4,\ f(x)=\frac{32}{3}\Rightarrow d=-12$	ddM1
	$f(x)=\frac{16}{3}x^{\frac{3}{2}}-\frac{3}{2}x^2+x-12$	A1 **(8)** **(10 marks)**

(a)

M1 Uses gradient of 5 at point $P\left(4,\frac{32}{3}\right)$ to form tangent. For example, $y-\frac{32}{3}=5(x-4)$

A1 $y=5x-\frac{28}{3}$ Accept recurring decimal, but $y=5x-9.33$ is A0.

(b)

M1 Attempts to integrate $\frac{4}{\sqrt{x}}-3$ with one **index** correct

A1 $\left(f'(x)\right)=\frac{4}{\sqrt{x}}-3\rightarrow 8x^{\frac{1}{2}}-3x+k$ with or without the $+k$

dM1 Substitutes $x=4, f'(x)=5$ into an integrated form (with + *k*) and proceeds to find the value of k

A1 $f'(x)=8x^{\frac{1}{2}}-3x+1$ which may be implied (allow if $k=1$ is found following a correct integral with *k*)

dM1 Dependent upon the first M. It is for integrating 'again' with one **term** correct

A1 $f(x)=\frac{16}{3}x^{\frac{3}{2}}-\frac{3}{2}x^2+kx+d$ following through on their $k\neq 0$ (which may be a letter or number) and with or without *d* (Both constants may be called *c* for this mark.)

ddM1 Dependent upon 1st and third M's (ie having attempted to integrate twice), **and** both "*k*" and "*d*" must have been added and processed correctly. Note "*cx* + *c*" will score M0 as this is not a correct process for both constant

This mark is scored for using $x=4, f(x)=\frac{32}{3}$ in an attempt to find '*d*'

A1 $f(x)=\frac{16}{3}x^{\frac{3}{2}}-\frac{3}{2}x^2+x-12$ oe ($x\sqrt{x}$ instead of $x^{\frac{3}{2}}$ is fine)