Question	Scheme	Marks	AOs
7(a)	$x^3 \to ...x^2$ and $3y^2 \to ...y\dfrac{dy}{dx}$	**M1**	1.1b
	$2xy \to 2y + 2x\dfrac{dy}{dx}$	**B1**	1.1b
	$3x^2 + 2x\dfrac{dy}{dx} + 2y + 6y\dfrac{dy}{dx} = ... \Rightarrow \dfrac{dy}{dx} = ...$	**M1**	2.1
	$\dfrac{dy}{dx} = -\dfrac{2y+3x^2}{2x+6y}$	**A1**	1.1b
		(4)	
(b)	$\dfrac{dy}{dx} = -\dfrac{2(5)+3(-2)^2}{2(-2)+6(5)}$ or e.g. $3(-2)^2 + 2(-2)\dfrac{dy}{dx} + 2\times5 + 6\times5\dfrac{dy}{dx} = 0 \Rightarrow \dfrac{dy}{dx} = ...\left(-\dfrac{11}{13}\right)$	**M1**	1.1b
	$y - 5 = "\dfrac{13}{11}"(x+2)$	**dM1**	1.1b
	$13x - 11y + 81 = 0$	**A1**	2.2a
		(3)	
		(7 marks)	

Notes

(a) Allow equivalent notation for the $\dfrac{dy}{dx}$ e.g. y'

M1: Attempts to differentiate $x^3 \to ...x^2$ **and** $3y^2 \to ...y\dfrac{dy}{dx}$ where … are constants

B1: Correct application of the product rule on $2xy$: $2xy \to 2x\dfrac{dy}{dx} + 2y$

Note that some candidates have a spurious $\dfrac{dy}{dx} = ...$ at the start (as their intention to differentiate) and this can be ignored for the first 2 marks

M1: For a valid attempt to make $\dfrac{dy}{dx}$ the subject, with exactly 2 different terms in $\dfrac{dy}{dx}$ coming from $3y^2$ and $2xy$. Look for $(... \pm ...)\dfrac{dy}{dx} = ... \Rightarrow \dfrac{dy}{dx} = ...$ which may be implied by their working.

Condone slips provided the intention is clear.

For those candidates who had a spurious $\dfrac{dy}{dx} = ...$ at the start, they may incorporate this in their rearrangement in which case they will have 3 terms in $\dfrac{dy}{dx}$ and so score M0.

If they ignore it, then this mark is available for the condition as described above.

A1: $\dfrac{dy}{dx} = -\dfrac{2y+3x^2}{2x+6y}$ oe e.g. $\dfrac{dy}{dx} = \dfrac{-2y-3x^2}{2x+6y}$, $\dfrac{2y+3x^2}{-2x-6y}$ Isw once a correct expression is seen.

Note that it is sometimes unclear if the minus sign(s) is/are correctly placed and you may have to use your judgement. Evidence may be available in part (b) to help you decide if they have the correct expression.

(b)

M1: Substitutes x = -2 and y = 5 into $\frac{dy}{dx} = "-\frac{2y+3x^2}{2x+6y}"$

They must have x's and y's in their $\frac{dy}{dx}$ but condone slips in substitution provided the intention is clear.

As a minimum look for at least one x and at least one y substituted correctly.

Note that this mark may be implied by their value for $\frac{dy}{dx}$ and may be implied if, for example, they find the negative reciprocal or the reciprocal of $"-\frac{2y+3x^2}{2x+6y}"$ and then substitute x = -2 and y = 5

Alternatively, substitutes x = -2 and y = 5 into their attempt to differentiate and then rearranges to find a value or numerical expression for $\frac{dy}{dx}$

dM1: Attempts to find the equation of the normal using their gradient of the tangent and x = -2 and y = 5 correctly placed. Score for an expression of the form $(y-5) = "\frac{13}{11}"(x+2)$ or if they use $y = mx + c$ they must proceed as far as c =… Must be using the **negative reciprocal** of the tangent gradient.

Note that $y-5 = \frac{2x+6y}{2y+3x^2}(x+2)$ is not a correct method unless the gradient is evaluated first *before* expanding.

A1: $13x - 11y + 81 = 0$ or any integer multiple of this equation including the "= 0", not just *a*, *b*, *c* given.

e.g., $26x - 22y + 162 = 0$ is likely if they don't cancel down their gradient.