Question	Scheme	Marks	AOs
7	$\mathrm{f}(x) = \frac{2}{x} - \mathrm{e}^x + 2x^2,\ x \in \mathbb{R},\ x \neq 0$		
(a)	Evaluates both $\mathrm{f}(-1.5)$ and $\mathrm{f}(-1)$	M1	1.1b
	$\mathrm{f}(-1.5) = 2.943536507...$ and $\mathrm{f}(-1) = -0.3678794412...$ Sign change and as $\mathrm{f}(x)$ is continuous α lies between -1.5 and -1	A1	2.4
		(2)	
(b)	(i) $\{x_3 =\}\ -1.0428$	B1	1.1b
	(ii) $\{\alpha =\}\ -1.06$ (2 dp)	B1	2.2a
		(2)	
(c)	$\{x_2 =\}\ 3 - \left(\frac{-1.4189}{-8.3078}\right)$	M1	1.1b
	$\{= 2.829208695...\}\ = 2.83$ (2 dp)	A1	1.1b
		(2)	
(d)	• Draws a tangent to the curve at $x = 1.5$ and identifies (possibly by writing x_2) where the tangent cuts the x-axis	M1	1.1b
	and concludes either • second approximation is not good because it is not in the interval [1.5, 3] • x_2 (which is indicated on Figure 3) is nowhere near the root β	A1	2.4
		(2)	
		(8 marks)	

Question 7 Notes:	
(a)	
M1:	Evaluates both $\mathrm{f}(-1.5)$ and $\mathrm{f}(-1)$
A1:	$\mathrm{f}(-1.5) =$ awrt 3 or $\mathrm{f}(-1.5) = 2$ (truncated) **and** $\mathrm{f}(-1) =$ awrt -0.4 or $\mathrm{f}(-1) = -0.3$ (truncated) **and** a correct conclusion
(b)(i)	
B1:	See scheme
(b)(ii)	
B1:	Deduces (e.g. using further iterations) that $\alpha = -1.06$ accurate to 2 dp
(c)	
M1:	Attempts $x_2 = x_1 - \frac{\mathrm{f}(x_1)}{\mathrm{f}'(x_1)}$; $x_1 = 3$; which can be evidenced by $3 - \left(\frac{-1.4189}{-8.3078}\right)$
A1:	2.83
(d)	
M1:	See scheme
A1:	See scheme