

M11Ac 2012/2013 (ADEC Grade 11 Academic Mathematics) mark scheme

Multiple Choice Questions (1 mark each; 10 marks in total):

Question	1	2	3	4	5	6	7	8	9	10
Answer	C	D	B	C	C	D	B	A	B	A
Type	II	IV	III	III	I	III	III	III	II	II

Student Response Questions: – **NO Half Marks**

	Answers	Mark Allocation	Total	TYPE
11a	$x + 4$ $\begin{array}{r} 2x^2 + 7x + 5 \\ \underline{2x^3 + 15x^2 + 33x + 20} \\ -(2x^3 + 8x^2) \\ \quad 7x^2 + 33x \\ \quad \underline{-(7x^2 + 28x)} \\ \quad \quad 5x + 20 \\ \quad \quad \underline{-(5x + 20)} \\ \quad \quad \quad 0 \end{array}$	[4] all correct -1 for each mistake	4	III
11b	$(x + 4)(2x^2 + 7x + 5)$ $(x + 4)(2x + 5)(x + 1)$	[1] Partially factorised [2] Fully factorised	2	I
12	$f(3) = -3$ $\Rightarrow (3)^3 + a(3)^2 + 8(3) - 9 = -3$ $\Rightarrow 42 + 9a = -3$ $\Rightarrow 9a = -45$ $a = -5$	[1] each line of working [1] [1] [1]	4	I
13a		[3] Correct x -intercepts [1] Correct y -intercept	4	IV
13b	Several vertical lines only crossing graph once	[1]	1	II
13c	At any time t object can only be in one place	[1] reasonable explanation	1	II
13d	$S(-1) = 1 \times -3 \times -5 = 15$ 1 second before the whistle blows the train is 15 metres in front of point O	[1] 15 m [1] 1 sec before	2	II

14a	$\log_a 3 = \frac{1}{2}$ $a^{\frac{1}{2}} = 3$ $a = 3^2$ $a = 9$ $y = \log_9 x$	[1] for $a^{\frac{1}{2}} = 3$ [1] for $a = 9$	2	II
14b		[1] Correct shape [1] Through (0,1) [1] x-axis asymptote	3	IV
14c	y-axis is an asymptote, x-axis is an asymptote Passes through (1,0), passes through (0,1) Domain $x > 0$, range $y > 0$ Passes through (3, $\frac{1}{2}$) passes through ($\frac{1}{2}$, 3)	[1] each relevant comparison	2	II
15	$f'(x) = \lim_{h \rightarrow 0} \frac{6(x+h)^2 - 6x^2}{h}$ $\frac{6(x^2 + 2xh + h^2) - 6x^2}{h}$ $\frac{12xh + 6h^2}{h}$ $12x + h$ $\therefore f'(x) = \lim_{h \rightarrow 0} 12x + h$ $\therefore f'(x) = 12x$	[1] [1] [1] [1] [1]	5	III

<p>16</p>	$3^{2x} - 10(3^x) + 9 = 0$ <p>Let $y = 3^x$</p> $y^2 - 10y + 9 = 0$ $(y - 9)(y - 1) = 0$ <p>$y = 9$ OR $y = 1$</p> <p>Substitute back for x</p> <p>For $y = 9,$</p> $3^x = 9$ $x = 2$ <p>For $y = 1,$</p> $3^x = 1$ $x \log 3 = \log 1$ $x = \frac{\log 1}{\log 3}$ $x = 0$	<p>[1] for changing to a quadratic [1] for factorising [1] for solutions</p> <p>[1] for first solution for x</p> <p>[1] for changing to logs</p> <p>[1] for second solution for x</p>	<p>6</p>	<p>III</p>
<p>17a 17b</p>		<p>[1] Reflected in the x axis [1] Correct points sketched accurately [1] Moved 4 units to the left [1] Sketched accurately</p>	<p>4</p>	<p>IV</p>
<p>17c</p>	<p>2 solutions</p>	<p>[1] for 2 solutions [1] for showing the solutions on the graph</p>	<p>2</p>	<p>IV</p>

18a	$1.2 \times 1.1^t = 2$ $1.1^t = \frac{2}{1.2} = 1.6666 \dots$ $t \log 1.1 = \log 1.66 \dots$ $t = \log 1.66 \dots \div \log 1.1$ $t = 5.4$ years	[1] [1] [1] [1] [1]rounded clearly	5	I												
18b	When $t = 10$, $h = 3.11$ When $t = 5$, $h = 1.93$ Average rate of change $\frac{3.11-1.93}{10-5} = \frac{1.18}{5} = 0.236$	[1] [1] [2]	4	III												
18c	Between 5 and 10 years after planting, the tree grows 24 cm per year on average	[1] 5 to 10 years after planting [1] 24 cm	2	II												
18d	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tbody> <tr> <td>15.1</td> <td>5.0607</td> <td>$\frac{5.0607-5.0127}{15.1-15} = 0.48$</td> </tr> <tr> <td>15.01</td> <td>5.0175</td> <td>$\frac{5.0175-5.0127}{15.01-15} = 0.48$</td> </tr> <tr> <td>14.9</td> <td>4.9651</td> <td>$\frac{5.0127-4.9651}{15-14.9} = 0.476$</td> </tr> <tr> <td>14.99</td> <td>5.0079</td> <td>$\frac{5.0127-5.0079}{15-14.99} = 0.48$</td> </tr> </tbody> </table>	15.1	5.0607	$\frac{5.0607-5.0127}{15.1-15} = 0.48$	15.01	5.0175	$\frac{5.0175-5.0127}{15.01-15} = 0.48$	14.9	4.9651	$\frac{5.0127-4.9651}{15-14.9} = 0.476$	14.99	5.0079	$\frac{5.0127-5.0079}{15-14.99} = 0.48$	[1] each line of the table	3	III
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18e	The gradient approaches 0.5	[1] 0.5	1	III												
18f	The tree cannot continue to grow forever at an increasing rate	[1]Any reasonable answer about continuing to grow [1]Rate of growth is increasing	2	II												
18g	$0 \leq x \leq 20$	[1] correct answer only	1	III												