



**B O A R D O F S T U D I E S**  
NEW SOUTH WALES

## 2009 HSC Mathematics Extension 1 Marking Guidelines

### Question 1 (a)

*Outcomes assessed: P3*

#### MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• One of the two factors correct, or equivalent progress	1

### Question 1 (b)

*Outcomes assessed: P5, H3*

#### MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

### Question 1 (c)

*Outcomes assessed: H5, H9*

#### MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

**Question 1 (d)***Outcomes assessed: PE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct solution	3
• Makes significant progress	2
• Recognises an appropriate method	1

**Question 1 (e)***Outcomes assessed: PE5, H5***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct solution	2
• Shows an understanding of the product rule or the chain rule	1

**Question 1 (f)***Outcomes assessed: HE6***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct answer	3
• Makes the correct substitution including correct limits, or equivalent merit	2
• Attempts the given substitution, or equivalent merit	1

**Question 2 (a)***Outcomes assessed: PE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct solution	3
• Obtains correct equations for $a$ and $b$ , or equivalent progress	2
• Shows some understanding of the remainder theorem	1

**Question 2 (b) (i)***Outcomes assessed: HE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct answer	2
• Correctly obtains $A$ or $\alpha$ , or equivalent progress	1

**Question 2 (b) (ii)***Outcomes assessed: HE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct solution	2
• Obtains a correct result for $x + \alpha$	1

**Question 2 (c) (i)***Outcomes assessed: PE4***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct solution	2
• Uses the equation of the parabola to show that the gradient at $P$ is $t$ (or equivalent progress)	1

**Question 2 (c) (ii)***Outcomes assessed: PE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct solution	2
• Attempts to solve simultaneously the equations for tangents at $P$ and $Q$	1

**Question 2 (c) (iii)***Outcomes assessed: PE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct answer	1

**Question 3 (a) (i)***Outcomes assessed: P5, H3***MARKING GUIDELINES**

Criteria	Marks
• Correct answer	1

**Question 3 (a) (ii)***Outcomes assessed: HE4***MARKING GUIDELINES**

Criteria	Marks
• Correct inverse function	2
• Makes significant progress	1

**Question 3 (b) (i)***Outcomes assessed: H5, H9***MARKING GUIDELINES**

Criteria	Marks
• Graphs showing important features, including 3 points of intersection	2
• Graphs showing some important features	1

**Question 3 (b) (ii)***Outcomes assessed: H5, H9***MARKING GUIDELINES**

Criteria	Marks
• Correct answer (from part (i))	1

**Question 3 (b) (iii)***Outcomes assessed: HE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct solution	3
• Computes appropriate derivative and shows some understanding of Newton's method	2
• Computes appropriate derivative, or equivalent merit	1

**Question 3 (c) (i)***Outcomes assessed: PE6***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct proof	2
• Makes significant progress	1

**Question 3 (c) (ii)***Outcomes assessed: H5, HE7***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct answer	1

**Question 4 (a) (i)***Outcomes assessed: HE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct answer	2
• Correct binomial coefficient, or equivalent merit	1

**Question 4 (a) (ii)***Outcomes assessed: HE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct answer	2
• Attempts to add appropriate probabilities, or equivalent merit	1

**Question 4 (a) (iii)***Outcomes assessed: HE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct answer	1

**Question 4 (b) (i)***Outcomes assessed: P5, PE2***MARKING GUIDELINES**

Criteria	Marks
• Correct solution	1

**Question 4 (b) (ii)***Outcomes assessed: H5, HE3***MARKING GUIDELINES**

Criteria	Marks
• Correct answer	1

**Question 4 (b) (iii)***Outcomes assessed: H6, HE4***MARKING GUIDELINES**

Criteria	Marks
• Correct solution	3
• Correct equation i.e. $6x^5 - 12x^3 - 18x = 0$	2
• Attempts to solve $f'(x) = 0$ , or equivalent merit	1

**Question 4 (b) (iv)***Outcomes assessed: H5, HE7***MARKING GUIDELINES**

Criteria	Marks
• Correct graph showing evenness, asymptote and stationary points	2
• Graph showing some important features	1



**Question 5 (a) (i)***Outcomes assessed: HE3, HE5***MARKING GUIDELINES**

Criteria	Marks
• Correct solution	3
• Makes significant progress	2
• Any statement equivalent to $\frac{d\left(\frac{1}{2}v^2\right)}{dx} = -nx^2$ , or equivalent merit	1

**Question 5 (a) (ii)***Outcomes assessed: HE3, HE5***MARKING GUIDELINES**

Criteria	Marks
• Correct answer	1

**Question 5 (a) (iii)***Outcomes assessed: HE3, HE5***MARKING GUIDELINES**

Criteria	Marks
• Correct answer	1

**Question 5 (a) (iv)***Outcomes assessed: HE3, HE5, HE7***MARKING GUIDELINES**

Criteria	Marks
• Correct solution	2
• Correct formula for $x$ , or correct value for $t$ from an incorrect formula	1

**Question 5 (b) (i)***Outcomes assessed: P4, PE3, PE6***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct solution	1

**Question 5 (b) (ii)***Outcomes assessed: HE4, HE7***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct solution	1

**Question 5 (b) (iii)***Outcomes assessed: HE4, HE7***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct solution	2
• Some understanding of related rates, or equivalent merit	1

**Question 5 (b) (iv)***Outcomes assessed: HE4, HE7***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct answer	1

**Question 6 (a) (i)***Outcomes assessed: HE3, HE7***MARKING GUIDELINES**

Criteria	Marks
• Correct solution	1

**Question 6 (a) (ii)***Outcomes assessed: HE3, HE7***MARKING GUIDELINES**

Criteria	Marks
• Correctly shows that $y_1 = y_2$ at time $T$	2
• Attempts to show that $y_1 = y_2$ at time $T$ , or equivalent merit	1

**Question 6 (a) (iii)***Outcomes assessed: HE3, HE7***MARKING GUIDELINES**

Criteria	Marks
• Correct solution	1

**Question 6 (b) (i)***Outcomes assessed: H5, HE2, HE3***MARKING GUIDELINES**

Criteria	Marks
• Correct solution	3
• Makes significant progress	2
• Correctly sums the geometric series, or equivalent merit	1

**Question 6 (b) (ii) (1)***Outcomes assessed: HE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct explanation	1

**Question 6 (b) (ii) (2)***Outcomes assessed: HE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct explanation	1

**Question 6 (b) (iii)***Outcomes assessed: HE3, HE7***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correct solution	3
• Uses the result in part (i) to make substantial progress	2
• Writes $S_n$ in a form allowing use of the result in part (i), or equivalent merit	1

**Question 7 (a) (i)***Outcomes assessed: P7***MARKING GUIDELINES**

Criteria	Marks
• Correct solution	1

**Question 7 (a) (ii)***Outcomes assessed: HE2***MARKING GUIDELINES**

Criteria	Marks
• Correct solution	2
• Establishes the inductive step, or equivalent merit	1

**Question 7 (b) (i)***Outcomes assessed: PE6, HE3, HE7***MARKING GUIDELINES**

Criteria	Marks
• Correct solution	2
• Attempts to use the identity to find $\theta$	1

**Question 7 (b) (ii)***Outcomes assessed: H5, HE4, HE7***MARKING GUIDELINES**

Criteria	Marks
• Correct solution	3
• Demonstrates understanding of the chain rule for differentiation and attempts to solve $\frac{d\theta}{dx} = 0$	2
• Demonstrates understanding of the chain rule for differentiation	1

**Question 7 (c) (i)***Outcomes assessed: P4, PE2, PE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Correct solution</li></ul>	3
<ul style="list-style-type: none"><li>• Any two of the observations below, or equivalent merit</li></ul>	2
<ul style="list-style-type: none"><li>• Observes that <math>\phi = \theta + \angle SRP</math></li></ul> OR <ul style="list-style-type: none"><li>• Observes that <math>\phi</math> remains constant as <math>P</math> moves</li></ul> OR <ul style="list-style-type: none"><li>• Observes that <math>\phi = \theta</math> when <math>P = T</math></li></ul> OR <ul style="list-style-type: none"><li>• Equivalent merit</li></ul>	1

**Question 7 (c) (ii)***Outcomes assessed: PE3***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Correct solution, showing evidence of using the correct circle property</li></ul>	1

# Mathematics Extension 1

## 2009 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
1 (a)	2	1.3	P3
1 (b)	1	4.1, 12.3	P5, H3
1 (c)	1	13.4	H5, H9
1 (d)	3	1.4	PE3
1 (e)	2	8.8, 13.5	PE5, H5
1 (f)	3	11.5	HE6
2 (a)	3	16.2	PE3
2 (b) (i)	2	5.9, 13.1	HE3
2 (b) (ii)	2	5.9, 13.3	HE3
2 (c) (i)	2	9.6	PE4
2 (c) (ii)	2	9.6	PE3
2 (c) (iii)	1	9.6	PE3
3 (a) (i)	1	4.1, 12.3	P5, H3
3 (a) (ii)	2	15.1	HE4
3 (b) (i)	2	13.3	H5, H9
3 (b) (ii)	1	13.3	H5, H9
3 (b) (iii)	3	16.4	HE3
3 (c) (i)	2	5.7	PE6
3 (c) (ii)	1	13.1	H5, HE7
4 (a) (i)	2	3.3, 18.2	HE3
4 (a) (ii)	2	18.2	HE3
4 (a) (iii)	1	18.2	HE3
4 (b) (i)	1	4.2	P5, PE2
4 (b) (ii)	1	10.5	H5, HE3
4 (b) (iii)	3	10.2	H6, HE4
4 (b) (iv)	2	10.5	H5, HE7
5 (a) (i)	3	14.4	HE3, HE5

Question	Marks	Content	Syllabus outcomes
5 (a) (ii)	1	14.4	HE3, HE5
5 (a) (iii)	1	14.4	HE3, HE5
5 (a) (iv)	2	14.4	HE3, HE5, HE7
5 (b) (i)	1	5.1, 5.5	P4, PE3, PE6
5 (b) (ii)	1	14.2	HE4, HE7
5 (b) (iii)	2	14.2	HE4, HE7
5 (b) (iv)	1	14.2	HE4, HE7
6 (a) (i)	1	14.3	HE3, HE7
6 (a) (ii)	2	14.3	HE3, HE7
6 (a) (iii)	1	14.3	HE3, HE7
6 (b) (i)	3	7.3, 17.3	H5, HE2, HE3
6 (b) (ii) (1)	1	18.1	HE3
6 (b) (ii) (2)	1	18.1	HE3
6 (b) (iii)	3	18.1	HE3, HE7
7 (a) (i)	1	8.8	P7
7 (a) (ii)	2	7.4, 8.8	HE2
7 (b) (i)	2	5.7, 15.2	PE6, HE3, HE7
7 (b) (ii)	3	10.6, 15.5	H5, HE4, HE7
7 (c) (i)	3	2.3, 2.10	P4, PE2, PE3
7 (c) (ii)	1	2.10	PE3