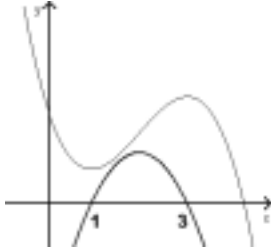


## Marking Scheme for HIGHER MATHS PRELIM 2008 PAPER 2

Question	1 mark for each •	Illustration of evidence for awarding a mark at each •
1a	Ans: proof •1 Finds the mid-point of OB •2 Finds the gradient of median AM •3 Substitutes into equation for straight line correctly 3 marks	• M(9,0) • $m_{AM} = \frac{12-0}{6-9} = -4$ • $y - 12 = -4(x - 6)$ or $y - 0 = -4(x - 9)$
1b	Ans: $y = \frac{1}{2}x$ •1 Finds mid-point of AB •2 Calculates gradient of 2nd median •3 Gives correct equation 3 marks	• midpoint of AB (12,6) • $m = \frac{6-0}{12-0} = \frac{1}{2}$ • $y = \frac{1}{2}x$
1c	Ans: Shows that D is (8,4) •1 Equates or uses simultaneous equations •2 Solves by algebra 2 marks	• $\frac{1}{2}x = -4x + 36$ • $9x = 72 \Rightarrow x = 8$ $y = \frac{1}{2} \times 8 = 4$
1d	Ans: shows that $ AD  = 2 DM $ •1 Calculates length AD •2 Calculates length DM •3 Demonstrates $ AD  = 2 DM $ 3 marks	• $ AD  = \sqrt{(6-8)^2 + (12-4)^2} = \sqrt{68}$ • $ DM  = \sqrt{(8-9)^2 + (4-0)^2} = \sqrt{17}$ • $\sqrt{68} = \sqrt{4 \times 17} = 2\sqrt{17}$ hence $ AD  = 2\sqrt{17} = 2 DM $
2a	Ans: $k = -\frac{1}{4}$ •1 Know how to find limit •2 Process 2 marks	• $4 = k \times 4 + 5$ • $k = -\frac{1}{4}$
2b	Ans: $m = -2$ •1 Interpret rec relation •2 Interpret rec relation •3 Arrange in standard quadratic form •4 Factorises quadratic •5 Uses limit condition 5 marks	• $U_1 = 3m + 5$ • $U_2 = m(3m + 5) + 5$ • $3m^2 + 5m - 2 = 0$ • $(3m - 1)(m + 2) = 0$ • $m = -2$
3a	Ans: (-2,1) •1 Substitutes for y in circle equation •2 Simplifies and solves for x •3 Substitutes to find y 3 marks	• $x^2 + (2x+5)^2 - 4x + 2(2x+5) - 15 = 0$ • $5(x+2)^2 = 0$ ; $x = -2$ • $y = 2(-2) + 5$ ; $y = 1$
3b	Ans: $(x+6)^2 + (y-3)^2 = 20$ •1 Establishes coordinates of B •2 Finds $r^2$ •3 Substitutes into general circle equation 3 marks	• B(-6,3) • $r^2 = 20$ • $(x+6)^2 + (y-3)^2 = 20$

Question	1 mark for each •	Illustration of evidence for awarding a mark at each •
4	Ans:  <ul style="list-style-type: none"> <li>•1 Interprets stationary points</li> <li>•2 Interpret between roots</li> <li>•3 Know that <math>f'(\text{cubic}) = \text{parabola}</math></li> </ul> 3 marks	<ul style="list-style-type: none"> <li>• Only two intercepts on the x-axis at 1 and 3</li> <li>• Function is +ve between the roots and -ve outwith</li> <li>• A parabola (symmetrical about midpoint of x-intercepts), stated or implied by the accuracy of the diagram.</li> </ul>
5a	Ans: Proof <ul style="list-style-type: none"> <li>•1 For correct length</li> <li>•2 For correct breadth</li> <li>•3 For correct volume</li> </ul> 3 marks	<ul style="list-style-type: none"> <li>• <math>10 - 2x</math></li> <li>• <math>5 - x</math></li> <li>• <math>2x^3 - 20x^2 + 50x</math></li> </ul>
5b	Ans: $x = \frac{5}{3}$ <ul style="list-style-type: none"> <li>•1 For knowing to differentiate</li> <li>•2 For correct derivative</li> <li>•3 For <math>V'(x) = 0</math></li> <li>•4 For correct solutions</li> <li>•5 For nature table</li> <li>•6 For selecting correct value for max.</li> </ul> 6 marks	<ul style="list-style-type: none"> <li>• <math>V'(x)</math></li> <li>• <math>6x^2 - 40x + 50</math></li> <li>• <math>6x^2 - 40x + 50 = 0</math></li> <li>• <math>x = \frac{5}{3}, x=5</math></li> <li>• Justify max at <math>x = \frac{5}{3}</math></li> <li>• <math>x = \frac{5}{3}</math></li> </ul>
5c	Ans: $V = 37\frac{1}{27}$ or $\frac{1000}{27}$ or 37.04 cu feet <ul style="list-style-type: none"> <li>•1 For correct substitution into <math>V(x)</math></li> <li>•2 For correct volume</li> </ul> 2 marks	<ul style="list-style-type: none"> <li>• <math>2(\frac{5}{3})^3 - 20(\frac{5}{3})^2 + 50(\frac{5}{3})</math></li> <li>• <math>V = 37\frac{1}{27}</math> or <math>\frac{1000}{27}</math> or 37.04 cu feet</li> </ul>
6a	Ans: $x = 2$ <ul style="list-style-type: none"> <li>•1 Know to differentiate</li> <li>•2 Differentiate</li> <li>•3 Set derivative equal to gradient</li> <li>•4 Start to solve</li> <li>•5 Process</li> </ul> 5 marks	<ul style="list-style-type: none"> <li>• <math>\frac{dy}{dx} = \dots</math></li> <li>• <math>12x - 3x^2</math></li> <li>• <math>12x - 3x^2 = 12</math></li> <li>• <math>3(x - 2)^2 = 0</math></li> <li>• <math>x = 2</math></li> </ul>
6b	Ans: $y = 12x - 8$ <ul style="list-style-type: none"> <li>•1 Substitutes and finds y coordinate</li> <li>•2 State equation of tangent</li> </ul> 2 marks	<ul style="list-style-type: none"> <li>• <math>y = 16</math></li> <li>• <math>y - 16 = 12(x - 2)</math></li> </ul> no need to simplify