

Mark Scheme 4724  
June 2005

1	<p>(Quotient =) <math>x^2 + 2x + 2</math></p> <p>(Remainder =) <math>0x - 3</math></p> <p>Allow without working</p>	<p>B1 M1  A1 A1 4</p>	<p>For correct leading term <math>x^2</math> in quotient For evidence of division/identity process For correct quotient For correct remainder. The '0x' need not be written but must be clearly derived. 4</p>
2	<p><math>x \sin x - \int \sin x \, dx</math> (= <math>x \sin x + \cos x</math>)</p> <p>Answer = <math>\frac{1}{2} \pi - 1</math></p>	<p>M1 A1 B1 M1 A1 5</p>	<p>For attempt at parts going correct way (<math>u = x, dv = \cos x</math> and <math>f(x) +/ - \int g(x) \, dx</math>) For both terms correct Indic anywhere that <math>\int \sin x \, dx = -\cos x</math> For correct method of limits For correct exact answer ISW 5</p>
3	<p>(i) <math>\mathbf{r} = (2\mathbf{i}-3\mathbf{j}+\mathbf{k}</math> or <math>-\mathbf{i}-2\mathbf{j}-4\mathbf{k}) + t(3\mathbf{i}-\mathbf{j}+5\mathbf{k})</math> (ii) <math>L(2) (\mathbf{r}) = 3\mathbf{i}+2\mathbf{j}-9\mathbf{k}+s(4\mathbf{i}-4\mathbf{j}+5\mathbf{k})</math> <math>L(1)\&amp;L(2)</math> must be of form <math>\mathbf{r} = \mathbf{a} + t\mathbf{b}</math> <math>2+3t=3+4s, -3-t=2-4s, 1+5t=-9+5s</math> or suitable equivalences <math>(t,s) = (+/-3,2)</math> or <math>(-/+1,1)</math> or <math>(-/+9,-7)</math> or <math>(+/-4,2)</math> or <math>(0,1)</math> or <math>(-/+8,-7)</math> Basic check other eqn &amp; interp <math>\checkmark</math></p>	<p>M1 A1 2 M1  M1 M1 A1 B1 5</p>	<p>For (either point) + t(diff betw vectors) Completely correct including <math>\mathbf{r} =</math>. AEF For point + (s or t) direction vector  For 2/3 eqns with 2 different parameters  For solving any relevant pair of eqns For both parameters correct 7</p>
4	<p>(i) <math>dx = \sec^2\theta \, d\theta</math> AEF  Indefinite integral = <math>\int \cos^2\theta \, d\theta</math> (ii) = <math>k \int +/ - 1 +/ - \cos 2\theta \, d\theta</math> <math>\frac{1}{2}[\theta + \frac{1}{2} \sin 2\theta]</math> Limits = <math>\frac{1}{4}\pi</math>(accept 45) and 0 <math>(\pi + 2)/8</math> AEF</p>	<p>M1 A1 A1 3 M1 A1 M1 A1 4</p>	<p>Attempt to connect <math>dx, d\theta</math> (not <math>dx = d\theta</math>) For <math>dx = \sec^2\theta \, d\theta</math> or equiv correctly used With at least one intermed step AG "Satis" attempt to change to double angle Correct attempt + correct integration New limits for <math>\theta</math> or resubstituting Ignore decimals after correct answer 7 Single 'parts' + <math>\sin^2\theta = 1 - \cos^2\theta</math> acceptable</p>
5	<p>(i) <math>\mathbf{OD} = \mathbf{OA} + \mathbf{AD}</math> or <math>\mathbf{OB} + \mathbf{BC} + \mathbf{CD}</math> AEF <math>\mathbf{AD} = \mathbf{BC}</math> or <math>\mathbf{CD} = \mathbf{BA}</math> <math>(\mathbf{a} + \mathbf{c} - \mathbf{b}) = 2\mathbf{j} + \mathbf{k}</math></p> <p>(ii) <math>\mathbf{AB} \cdot \mathbf{CB} =  \mathbf{AB}   \mathbf{CB}  \cos \theta</math> Scalar product of any 2 vectors Magnitude of any vector <math>94^\circ(94.386\dots)</math> or <math>1.65(1.647\dots)</math></p>	<p>M1 A1 A1 3  M1 M1 M1 A1 4</p>	<p>Connect <math>\mathbf{OD}</math> &amp; 2/3/4 vectors in their diag Or similar, from their diag [i.e. if diag mislabelled, M1A1A0 possible]  Or <math>\mathbf{AB} \cdot \mathbf{BC}</math> i.e. scalar prod for correct pair <math>2 + 3 - 6 = -1</math> is expected <math>\sqrt{19}</math> or 3 expected Accept <math>86^\circ(85.614\dots)</math> or <math>1.49(424\dots)</math> 7</p>
6	<p>(i) For <math>d/dx (y^2) = 2y \, dy/dx</math> Using <math>d(uv) = u \, dv + v \, du</math> <math>2xy \, dy/dx + y^2 = 2 + 3 \, dy/dx</math></p> <p><math>dy/dx = (2 - y^2)/(2xy - 3)</math></p>	<p>B1 M1 A1 M1  A1 5</p>	<p>Solving an equation, with at least 2 <math>dy/dx</math> terms, for <math>dy/dx</math>; <math>dy/dx</math> on one side, non <math>dy/dx</math> on other. AG</p>



$c = \ln 80$ $k = 1/5 \ln 5/3$ $\theta = 20 + 80e^{-\left(\frac{1}{5} \ln \frac{5}{3}\right)t}$ (iii) Substitute $\theta = 68 - 32$ $t = 15.75$ Extra time = 10.75, $\sqrt{\text{their } 15.75 - 5}$	A1 M1 A1 <b>8</b>  M1 A1 B1 <b>3</b>	k ]   AG  Subst into AEF of given eqn & solve Accept 15.7 or 15.8 f.t. only if $\theta = \text{their } (68 - 32)$ or 32 <b>13</b>
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