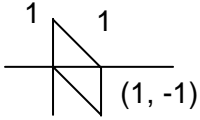
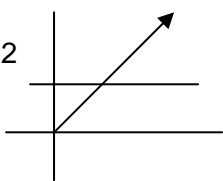


## 4725 Further Pure Mathematics 1

1	(i)  (ii) $\begin{pmatrix} 1 & 0 \\ -1 & 1 \end{pmatrix}$	M1 A1  B1 B1	2  2 <b>4</b>	For 2 other correct vertices seen, correct direction of shear seen For completely correct diagram, must include scales  Each column correct
2	$\frac{a}{6}n(n+1)(2n+1) + bn$  $a = 6 \quad b = -3$	M1 A1  M1 A1 A1	5  5 <b>5</b>	Consider sum as two separate parts Correct answer a.e.f.  Compare co-efficients Obtain correct answers
3	(i) $7u^3 + 24u^2 - 3u + 2 = 0$  (ii) <i>EITHER</i> correct value is $-\frac{3}{7}$  <i>OR</i>  correct value is $-\frac{3}{7}$	M1 A1  M1 A1ft  M1 A1	2  2  2  <b>4</b>	Use given substitution Obtain correct equation a.e.f.  Required expression related to new cubic Their c / their a  Use $\frac{\alpha + \beta + \gamma}{\alpha\beta\gamma}$ or equivalent Obtain correct answer
4	(i) $z^* = 3 + 4i$ $21 + 12i$  (ii) $3 - 5i$  $-16 - 30i$  (iii) $\frac{9}{25} + \frac{12}{25}i$	B1 B1  B1 B1ft B1ft  M1 A1 A1	2  3  3 <b>8</b>	Conjugate seen or implied Obtain correct answer  Correct $z - i$ or expansion of $(z - i)^2$ seen Real part correct Imaginary part correct  Multiply by conjugate Numerator correct Denominator correct
5	(i) $\begin{pmatrix} -13 \\ 1 \\ -10 \end{pmatrix}$  (ii) $\begin{pmatrix} 8 & 16 & -4 \\ 0 & 0 & 0 \\ 6 & 12 & -3 \end{pmatrix}$  (iii) (8)	B1 B1  M1 A1A1A1  M1 A1	2  4  2 <b>8</b>	<b>4B</b> seen or implied or 2 elements correct Obtain correct answer  Obtain a 3 x 3 matrix Each row (or column) correct  Obtain a single value Obtain correct answer, must have matrix

6	<p>(i) </p> <p>(ii) <math>2\sqrt{3} + 2i</math></p>	<p>B1 B1 B1 B1 B1</p> <p>B1 M1 A1</p>	<p>5</p> <p>3</p> <p><b>8</b></p>	<p>Horizontal straight line in 2 quadrants Through (0, 2) Straight line Through O with positive slope In 1<sup>st</sup> quadrant only</p> <p>State or obtain algebraically that <math>y = 2</math> Use suitable trigonometry Obtain correct answer a.e.f. decimals OK must be a complex number</p>
7	<p>(i) <math>a = -6</math></p> <p>(ii) <math>\mathbf{A}^{-1} = \frac{1}{a+6} \begin{pmatrix} 1 &amp; -3 \\ 2 &amp; a \end{pmatrix}</math></p> <p><math>x = \frac{4}{a+6}, y = \frac{2-a}{a+6}</math></p>	<p>M1 A1</p> <p>B1 B1ft</p> <p>M1</p> <p>A1ft A1ft</p>	<p>2</p> <p>5</p> <p><b>7</b></p>	<p>Use <math>\det \mathbf{A} = 0</math> Obtain correct answer</p> <p>Both diagonals correct Divide by <math>\det \mathbf{A}</math></p> <p>Premultiply column by <math>\mathbf{A}^{-1}</math>, no other method Obtain correct answers from their <math>\mathbf{A}^{-1}</math></p>
8	<p>(i) <math>u_2 = 4, u_3 = 9, u_4 = 16</math></p> <p>(ii) <math>u_n = n^2</math></p> <p>(iii)</p>	<p>M1 A1</p> <p>B1</p> <p>B1 M1 A1 A1</p>	<p>2</p> <p>1</p> <p>4</p> <p><b>7</b></p>	<p>Obtain next terms All terms correct</p> <p>Sensible conjecture made</p> <p>State that conjecture is true for <math>n = 1</math> or <math>2</math> Find <math>u_{n+1}</math> in terms of <math>n</math> Obtain <math>(n+1)^2</math> Statement of Induction conclusion</p>
9	<p>(i) <math>\alpha^3 + 3\alpha^2\beta + 3\alpha\beta^2 + \beta^3</math></p> <p>(ii) <i>Either</i> <math>\alpha + \beta = 5, \alpha\beta = 7</math></p> <p><math>\alpha^3 + \beta^3 = 20</math></p> <p><math>x^2 - 20x + 343 = 0</math></p> <p><i>Or</i></p> <p><math>u^{\frac{2}{3}} - 5u^{\frac{1}{3}} + 7 = 0</math></p> <p><math>u^3 - 20u + 343 = 0</math></p>	<p>M1 A1</p> <p>B1 B1</p> <p>M1 A1</p> <p>M1</p> <p>A1ft</p> <p>M1 A1</p> <p>M2 A2</p>	<p>2</p> <p>6</p> <p><b>8</b></p>	<p>Correct binomial expansion seen Obtain given answer with no errors seen</p> <p>State or use correct values</p> <p>Find numeric value for <math>\alpha^3 + \beta^3</math> Obtain correct answer</p> <p>Use new sum and product correctly in quadratic expression Obtain correct equation Substitute <math>x = u^{\frac{1}{3}}</math> Obtain correct answer Complete method for removing fractional powers Obtain correct answer</p>

10	(i)	M1 A1	2	Attempt to combine 3 fractions Obtain given answer correctly	
	(ii)	M1 A1 M1 A1 M1 A1	6	Express at least first 3 terms using (i) All terms correct Express at least last 2 terms using (i) All terms correct in terms of $n$ Show that correct terms cancel Obtain unsimplified correct answer	
	(iii)	$\frac{5}{2}$	B1ft	1	Obtain correct answer from their (ii)
	(iv)	$\frac{2}{N+1} + \frac{1}{N+2} = \frac{7}{10}$  $7N^2 - 9N - 36 = 0$  $N = 3$	B1ft  M1  A1 A1	4	Their (iii) – their (ii)  Attempt to clear fractions & solve equation, Obtain correct simplified equation Obtain only the correct answer
			<b>13</b>		