

FP1 Jan 2009

1. $x = \frac{1 \pm i}{2}$
2. (b) 15520
3. (a) $xy = 5^2 = 25$ (b) (15, 3)
5. (b) $f'(x) = \frac{3}{2}x^{-\frac{1}{2}} - 9x^{-\frac{3}{2}}$ (c) 1.15
7. (a) $\mathbf{X}^{-1} = \frac{1}{a-2} \begin{pmatrix} -1 & -a \\ 1 & 2 \end{pmatrix}$ (b) $a = 3$
8. (b) $y - aq = -qx$ (d) $(-a, 2aq)$
9. (a) $z_2 = 2 - 3i$ (d) $\frac{5}{2} - \frac{1}{2}i$ (e) $\frac{\sqrt{26}}{2}$
10. (b) $\begin{pmatrix} 3 & -3 \\ 3 & 3 \end{pmatrix}$ (d) (0,0) (90,0) (51,75)
(e) 187.5

FP1 June 2009

1. (b) $\sqrt{5}$ (c) -0.46 or 5.82 (d) $-5 + 2i$
2. (b) 707210
3. (a) $x = ki; x = 2i; x = -4 + 3i; x = -4 - 3i$
(b) -8
4. (b) 2.219 (c) 2.218
5. (a) $\mathbf{R}^2 = \begin{pmatrix} a^2 + 2a & 2a + 2b \\ a^2 + ab & 2a + b^2 \end{pmatrix}$ (b) $a = 3, b = -3$

6. (a) (4, 0) (d) $16t(1+t^2)$ for $t > 0$

7. (a) $\frac{1}{2}$ (b) $\mathbf{B}^{-1} = \frac{1}{10} \begin{pmatrix} 4 & 2 \\ 1 & 3 \end{pmatrix}$

FP1 Jan 2010

1. (a) $-3 + 5i$ (b) $\sqrt{34}$ (c) 2.11
2. (b) 0.268
4. (a) $(\frac{1}{3}, 2)$ (b) $14\frac{2}{3}$
5. (a) $a^2 + 4a + 10$ (b) $\frac{1}{10} \begin{pmatrix} 4 & 5 \\ -2 & 0 \end{pmatrix}$
6. (a) $5 - 2i$ (b) $c = 49, d = -58$
7. (b) $\left(-5c, -\frac{c}{5}\right), \left(3c, \frac{c}{3}\right)$
8. (c) 95282
9. (a) anticlockwise rotation through $\frac{\pi}{4}$ (b) $p = 7, q = 1$
(c) $5\sqrt{2}$ (d) $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ (e) $(4\sqrt{2}, 3\sqrt{2})$

FP1 June 2010

1. (b) 13 (c) -1.97
2. (b) $\mathbf{M}^{-1} = -\frac{1}{10} \begin{pmatrix} 2 & -3 \\ -6 & 4 \end{pmatrix}$ (c) $a = \pm 3$
3. (b) [1.425, 1.45] (c) 1.427
4. (a) $a = -2$, $b = 50$ (b) $1 + 7i$, $1 - 7i$ (c) -1
5. (b) $\frac{8}{15}$
6. (a) $\begin{pmatrix} 8 & 0 \\ 0 & 8 \end{pmatrix}$ (b) $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ (c) $\begin{pmatrix} 8 & 0 \\ 0 & -8 \end{pmatrix}$
 (d) $\begin{pmatrix} 6k+c & 0 \\ 4k+2c & -8 \end{pmatrix}$ (e) $k = 2$, $c = -4$
8. (a) $\frac{c}{3}$ (c) $x = -\frac{c}{27}$, $y = -27c$

FP1 Jan 2011

1. (a) $16 - 30i$ (b) $\frac{1}{2} - 2i$

2. (a) $\begin{pmatrix} -6 & -2 \\ 0 & 1 \end{pmatrix}$ (b) reflection about the y-axis
 (c) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
3. (a) 1.741 (b) $f'(x) = 10x - 6x^{\frac{1}{2}}$ (c) 1.745
4. (a) $2 + 4i$ (b) $p = -4$, $q = 20$
5. (b) 1 837 680
6. (a) (9, 0) (b) $x = -9$ (c) 25 (d) (16, 24) (e) 408
7. (b) -2.86 (c) $a = -2\sqrt{3}$, $b = 2$ (d) 100
8. (a) 4 (b) $\frac{1}{4} \begin{pmatrix} 3 & 2 \\ 1 & 2 \end{pmatrix}$ (c) 18 (d) (2, 2), (14, 10), (11, 5)
10. (b) (9, 4) and (-3, -12)

FP1 June 2011

1. (b) [1. 125]
2. (a) $\sqrt{5}$ (b) 2.68 (c) $z_2 = 5 + \sqrt{3}i$, $z_3 = 5 - \sqrt{3}i$
3. (a) (i) $\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$, (ii) enlargement, scale factor 3, centre (0, 0)
 (b) reflection in the line $y = -x$ (c) $k = 3$
4. (a) $f'(x) = 2x - \frac{5}{2x^2} - 3$ (b) 0.869
5. (a) $a = 3$, $b = 1$ (b) 150 (square units)
6. (a) $x = 5$, $y = -2$
7. (b) $a = 52$, $b = -1$
8. (a) $x + 12 = 0$ (c) (-12, -18)

FP1 Jan 2012

1. (a) $-\frac{\pi}{4}$ (b) $7 + i$ (c) $\frac{1}{2} + \frac{7}{2}i$
2. (b) $[0.625, 0.75]$ (c) 0.724
3. (a) $(4, 0), x + 4 = 0$
4. (a) $(1, 1), (1, 2)$ and $(4, 2)$ (b) Reflection in line $y = x$
(c) $\begin{pmatrix} -2 & 0 \\ 0 & 2 \end{pmatrix}$ (d) -4 (e) 6
5. (a) $3 - i, 2$
6. (c) $1\,589\,463$
7. (a) $3, 7$
8. (b) $-\frac{1}{2} \begin{pmatrix} 3 & -1 \\ -2 & 0 \end{pmatrix}$
9. (b) $x + q^2y = 6q$ (c) $\left(\frac{6pq}{p+q}, \frac{6}{p+q} \right)$

FP1 June 2012

1. (b) $x = 4, \frac{-2 \pm 2i}{4}$
2. (a) $\begin{pmatrix} 4 & 2 \\ 9 & 9 \end{pmatrix}$ (b) $k = \frac{3}{2}$
3. 4.53
4. (b) $203\,850$
5. (a) 6 (b) $(4\frac{1}{2}, 6)$ (c) $12x - 5y - 24 = 0$
6. (b) 1.61
7. (a) -0.71 (b) $3 - 5i\sqrt{3}$ (c) $3 + 2i\sqrt{3}$ (d) $-\frac{4}{3}$
8. (b) $c = 3\sqrt{2}$
9. (a) -23 (b) $a = 5$ (c) 12 (d) 276
(e) rotation 90° anti-clockwise about $(0, 0)$ (f) $\begin{pmatrix} -4 & 3 \\ 5 & 2 \end{pmatrix}$

FP1 Jan 2013

2. (a) $z = 6 - 8i$ (b) $z^2 = -28 - 96i$
 (c) $|z| = 10$ (d) $a = -106.3^\circ$ or 253.7°
3. (a) $f'(x) = x^{-\frac{1}{2}} - \frac{1}{2}x^{-\frac{3}{2}}$ (b) 5.20
4. (a) $\mathbf{P} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ (b) $\mathbf{Q} = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ (c) $\mathbf{R} = \mathbf{QP}$
 (d) $\mathbf{R} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ (e) Reflection in the y -axis
5. (a) $\frac{3}{2}i, -\frac{3}{2}i, 3 + 5i, 3 - 5i$
6. (a) $a = \frac{2}{3}$ (b) $\mathbf{Y}^{-1} = \frac{1}{5} \begin{pmatrix} 2 & 1 \\ -3 & 1 \end{pmatrix}$ (c) $A = (\lambda, 2\lambda - 1)$
7. (b) $q^2y + x = 10q$ (d) $p^2q^2 = 1$
9. (a) $(y - 12) = -\frac{2}{3}(x - 4)$ (b) Area $PSN = 78$ units²

FP1 June 2013

1. $x = -4, x = 3$
2. (b) $\alpha = 2.81$
3. (a) $k = 30$ (b) $x = 2 \pm 3i$
4. (b) $x = 16, y = \frac{1}{4}$

5. (b) $a = 13, b = 36, c = 26$
6. (b) $qy - x = aq^2$ (c) $R(apq, ap + aq)$ (d) $pq = -1$
7. (a) $5\sqrt{2}$ (b) $\frac{(12a - 5b) + (5a + 12b)i}{13}$
 (c) $a = 1, b = -1$ (d) -0.391 or 5.89
8. (c) $\begin{pmatrix} k+1 \\ 2k-1 \end{pmatrix}$

FP1 June 2013 (R)

1. (a) $8 + 5i$ (b) $6 - 16i$
2. (i)(a) $\begin{pmatrix} 2k+4 & k \\ -3 & -2 \end{pmatrix}$ (i)(b) $k = -8$ (ii)
- $\begin{pmatrix} 4 & -2 & 10 \\ -6 & 3 & -15 \\ 8 & -4 & 20 \end{pmatrix}$
3. (b) $2.125 \leq \alpha \leq 2.25$ (c) $\beta_2 = 1.39$
4. (a) $x = \frac{3i}{2}, -\frac{3i}{2}, 1 + 2i, 1 - 2i$
5. (b) $P\left(6, \frac{3}{2}\right), Q\left(-\frac{9}{4}, -4\right)$
6. (a) $\mathbf{P} = \begin{pmatrix} 1 & 4 \\ -2 & -3 \end{pmatrix}$ (b) $\frac{24}{5}$ units² (c) $\mathbf{Q} = \frac{1}{5} \begin{pmatrix} -3 & -4 \\ 2 & 1 \end{pmatrix}$
7. (b) $Q(0, at)$
8. (b) $a = 52, b = 12, c = -1$
9. (a) $|w| = 5\sqrt{5}$ (b) $\arg w = -0.46$
 (c) $z = 3 - 7i$ (d) $\lambda = -6$

10. (i) 88 800 (ii) $a = 2, b = 2, c = 3$

FP1 June 2014

1. (a) $\frac{p-4}{5} + \frac{2p+2}{5}i$ (b) $p = \pm 29$
2. (b) $f'(x) = 3x^2 + \frac{15}{4}x^{\frac{5}{2}} + 2$ (c) $\alpha_2 = 1.291$
3. (a) $1 + 5i$ (b) $p = -4, q = -52$
4. (i) (a) $\begin{pmatrix} 4 & 5 & 6 \\ 5 & -6 & 11 \\ 13 & 11 & 21 \end{pmatrix}$ (ii) $C^{-1} = \frac{1}{2k^2+6} \begin{pmatrix} k & 2 \\ -3 & 2k \end{pmatrix}$
6. (b) $A \left(\frac{ct^4 - c}{t^3}, 0 \right), B(2ct, 0)$ (c) Area APB = $8 \left(1 + \frac{1}{t^4} \right)$
7. (i)(a) $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ (b) $\begin{pmatrix} -\frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{pmatrix}$ (c)
- $\begin{pmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{pmatrix}$
- (ii) $k = \frac{13}{2}$
8. (b) $y = 6k$

FP1 June 2014 (R)

1. (a) $z_3 = -\frac{1}{2}$
2. (b) $\alpha_2 = 2.336$
3. (i) (b) $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$ (ii) $k = 2.5$
4. (a) $\frac{5p}{p^2+9}, +\frac{6-p^2}{p^2+9}i$ (b) $p = 1, p = -6$
5. (a) $\frac{1}{4}n(n+1)(n+3)(n-2)$ (b) 1619910
6. (a) $\begin{pmatrix} 1 & -1 \\ -7 & -2 \end{pmatrix}$ (b) $C = -\frac{1}{9} \begin{pmatrix} -5 & -2 \\ 13 & 7 \end{pmatrix}$
7. (c) $y = 0, x = 2a + ap^2$ (d) $2a^2p(1 + p^2)$
8. $\left(-\frac{1}{3}c, -3c \right), \left(\frac{3}{2}c, \frac{2}{3}c \right)$