

Solomon Practice Paper

Pure Mathematics 6E

Time allowed: 90 minutes

Centre: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	5	
2	6	
3	6	
4	8	
5	11	
6	13	
7	13	
8	13	
Total:	75	

How I can achieve better:

-
-
-



Last updated: December 24, 2025



5. A transformation T from the z -plane to the w -plane is defined by

$$w = z^2$$

where $z = x + iy$, $w = u + iv$ and x, y, u and v are real.

- (a) Show that T transforms the line $\text{Im}(z) = 2$ in the z -plane onto a parabola in the w -plane and find an equation of the parabola, giving your answer in terms of u and v . [5]

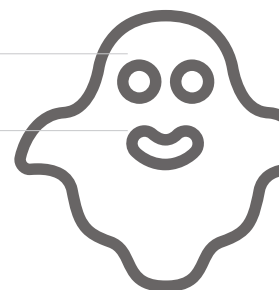
The image in the w -plane of the half-line $\arg(z) = \frac{\pi}{4}$ is the half-line l .

- (b) Find an equation of l . [2]

The parabola and the half-line in the w -plane are represented on the same Argand diagram. Their point of intersection is represented by P .

- (c) Find the complex number which is represented by P , giving your answer in the form $a + ib$ where a and b are real. [4]

Total: 11



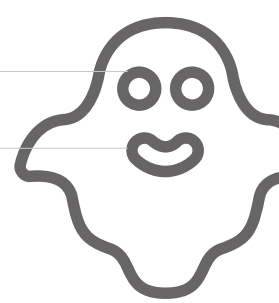
6. It is given that y satisfies the differential equation

$$\frac{dy}{dx} = x^2 + y \cos(x) \quad \text{and} \quad y = 1 \quad \text{at} \quad x = 0.$$

- (a) i. Use the differential equation to find expressions for $\frac{d^2y}{dx^2}$ and $\frac{d^3y}{dx^3}$. [10]
- ii. Hence, or otherwise, find y as a series in ascending powers of x up to and including the term in x^3 .
- iii. Use your series to estimate the value of y at $x = -0.1$.

- (b) Use the approximation $\left(\frac{dy}{dx}\right)_0 \approx \frac{y_1 - y_{-1}}{2h}$ to estimate the value of y at $x = 0.1$. [3]

Total: 13



8. The transformation $T: \mathbb{R}^3 \mapsto \mathbb{R}^3$ is represented by the matrix \mathbf{M} where

$$\mathbf{M} = \begin{pmatrix} 2 & 1 & -1 \\ 0 & 3 & 1 \\ 2 & 2 & 0 \end{pmatrix}.$$

(a) Find \mathbf{M}^{-1} , showing your working clearly. [6]

(b) Find the Cartesian equations of the line mapped by the transformation T onto the line with equations [7]

$$\frac{x - 1}{3} = \frac{y + 1}{-3} = \frac{z}{4}.$$

Total: 13

