

Solomon Practice Paper

Pure Mathematics 6B

Time allowed: 90 minutes

Centre: www.CasperYC.club

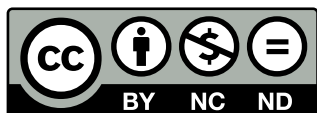
Name:

Teacher:

Question	Points	Score
1	5	
2	5	
3	5	
4	6	
5	11	
6	12	
7	14	
8	17	
Total:	75	

How I can achieve better:

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Last updated: July 14, 2025



1. Given that x is so small that terms in x^3 and higher powers of x may be neglected, find the values of the constants a and b for which [5]

$$\frac{\ln(1 + ax)}{1 + bx} = 3x + \frac{3}{2}x^2.$$



2. Given that

$$|z + 1 - 4i| = 1,$$

- (a) sketch, in an Argand diagram, the locus of z , [2]
- (b) find the maximum value of $\arg(z)$ in degrees to one decimal place. [3]

Total: 5



3. (a) Show that

[2]

$$\cosh(\mathbf{i}x) = \cos(x) \quad \text{where } x \in \mathbb{R}.$$

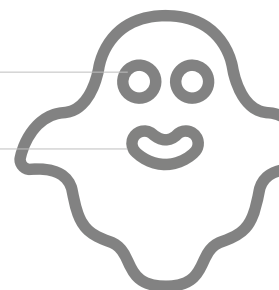
(b) Hence, or otherwise, solve the equation

[3]

$$\cosh(\mathbf{i}x) = e^{\mathbf{i}x}$$

for $0 \leq x < 2\pi$.

Total: 5

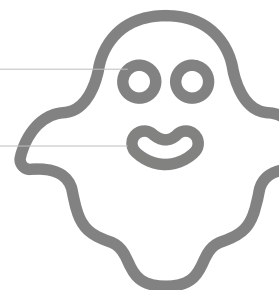


4. Given that

[6]

$$u_{n+2} = 5u_{n+1} - 6u_n \quad n \geq 1, \quad u_1 = 2 \quad \text{and} \quad u_2 = 4,$$

prove by induction that $u_n = 2^n$ for all integers $n, n \geq 1$.



5.

$$\mathbf{M} = \begin{pmatrix} 1 & 2 & -1 \\ 0 & 1 & -4 \\ x & 3 & -1 \end{pmatrix}.$$

- (a) Given that $\lambda = -1$ is an eigenvalue of \mathbf{M} , find the value of x . [3]
- (b) Show that $\lambda = -1$ is the only real eigenvalue of \mathbf{M} . [6]
- (c) Find an eigenvector corresponding to the eigenvalue $\lambda = -1$. [2]

Total: 11



6. A student is looking at different methods of solving the differential equation

$$\frac{dy}{dx} = xy, \quad y = 1 \quad \text{when} \quad x = 0.2.$$

The first method the student tries is to use the approximation

$$\left(\frac{dy}{dx}\right)_0 \approx \frac{y_1 - y_0}{h}$$

twice with a step length of 0.1 to obtain an estimate for y at $x = 0.4$.

- (a) Find the value of the student's estimate for y at $x = 0.4$. [6]

The student then realises that the exact value of y at $x = 0.4$ can be found using integration.

- (b) Use integration to find the exact value of y at $x = 0.4$. [4]

- (c) Find, correct to 1 decimal place, the percentage error in the estimated value in part (a). [2]

Total: 12



[3]

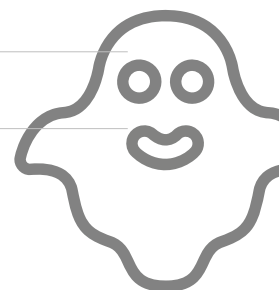
where n is a positive integer.

[8]

find the values of the constants A and B .

[3]

Total: 14



- (a) Find $\overrightarrow{AB} \times \overrightarrow{AC}$. [5]

- (b) Find the volume of the tetrahedron $ABCD$. [3]

(c) Find a vector equation of Π in the form $\mathbf{r} \cdot \mathbf{n} = p$. [3]

(d) Find the coordinates of E . [6]

Total: 17

