

Solomon Practice Paper

Further Pure Mathematics 2B

Time allowed: 90 minutes

Centre: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	7	
2	8	
3	9	
4	11	
5	12	
6	13	
7	15	
Total:	75	

How I can achieve better:

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Last updated:

July 14, 2025



1. Given that

[7]

$$y \arccos(x) - \frac{x}{\pi} e^{2x} - 1 = 0,$$

find the value of $\frac{dy}{dx}$ at the point where $x = 0$, giving your answer in terms of π .



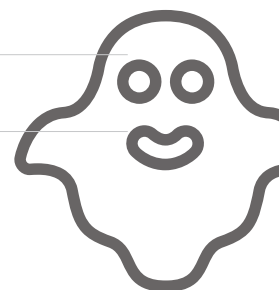
2.

[8]

$$f(x) = 5 \cosh(x) + 3 \sinh(x).$$

The minimum value of $f(x)$ occurs at the point $(p \ln q, r)$ where p, q and r are integers.

Find the values of p, q and r .



3. The line $y = mx + c$ is a tangent to the rectangular hyperbola with equation $xy = -9$.
- (a) Show that $c = \pm 6\sqrt{m}$. [4]
- (b) Hence, or otherwise, find the equations of the tangents from the point $(4, -2)$ to the rectangular hyperbola $xy = -9$. [5]

Total: 9



4. The curve C is defined by [11]

$$y^2 = x, \quad x \geq 0, \quad y \geq 0.$$

The region between C , the x -axis and the line $x = 1$ is rotated through 2π about the x -axis.
Show that the area of the surface generated is

$$\frac{\pi}{6} \left(5\sqrt{5} - 1 \right).$$



- $$\int \operatorname{sech}(x) \, dx = 2 \arctan e^x + c.$$

(d) Find the volume of revolution of the solid generated. [4]

(e) Find the limit of the volume of revolution as $a \rightarrow \infty$. [1]



6.

$$I_n = \int_0^{\sqrt{2}} (2 - x^2)^n \, dx, \quad n \geq 0.$$

(a) Show that

[9]

$$I_n = \frac{4n}{2n + 1} I_{n-1}, \quad n \geq 1.$$

(b) Hence evaluate I_3 , leaving your answer in surd form.

[4]

Total: 13



7. The curve C has intrinsic equation

$$s = \ln \left(\tan \frac{1}{2} \psi \right), \quad 0 < \psi \leq \frac{\pi}{2}.$$

(a) Show that radius of curvature of C is given by $\rho = \operatorname{cosec} \psi$. [4]

Given that $y = \psi = \frac{\pi}{2}$ when $x = 0$,

(b) show that $y = \psi$, [4]

(c) use integration to show that a Cartesian equation of C is $x = \ln(\sin y)$. [7]

Total: 15

