

Solomon Practice Paper

Core Mathematics 3B

Time allowed: 90 minutes

Centre: www.CasperYC.club

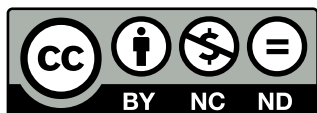
Name:

Teacher:

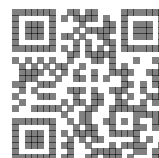
Question	Points	Score
1	7	
2	9	
3	9	
4	10	
5	13	
6	13	
7	14	
Total:	75	

How I can achieve better:

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Last updated: May 5, 2023



1. (a) Simplify [3]

$$\frac{x^2 + 7x + 12}{2x^2 + 9x + 4}.$$

- (b) Solve the equation [4]

$$\ln(x^2 + 7x + 12) - 1 = \ln(2x^2 + 9x + 4),$$

giving your answer in terms of e .

Total: 7

2. A curve has the equation $y = \sqrt{3x + 11}$.

The point P on the curve has x -coordinate 3.

- (a) Show that the tangent to the curve at P has the equation [6]

$$3x - 4\sqrt{5}y + 31 = 0.$$

The normal to the curve at P crosses the y -axis at Q .

- (b) Find the y -coordinate of Q in the form $k\sqrt{5}$. [3]

Total: 9

3. (a) Use the identities for $\sin(A + B)$ and $\sin(A - B)$ to prove that [4]

$$\sin(P) + \sin(Q) \equiv 2 \sin\left(\frac{P + Q}{2}\right) \cos\left(\frac{P - Q}{2}\right).$$

- (b) Find, in terms of π , the solutions of the equation [5]

$$\sin(5x) + \sin(x) = 0,$$

for x in the interval $0 \leq x < \pi$.

Total: 9

4. The curve with equation

$$y = x^{\frac{5}{2}} \ln\left(\frac{x}{4}\right), x > 0$$

crosses the x -axis at the point P .

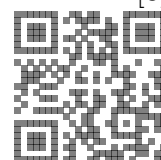
- (a) Write down the coordinates of P . [1]

The normal to the curve at P crosses the y -axis at the point Q .

- (b) Find the area of triangle OPQ where O is the origin. [6]

The curve has a stationary point at R .

- (c) Find the x -coordinate of R in exact form. [3]



Total: 10

5.

$$f(x) \equiv 2x^2 + 4x + 2, \quad x \in \mathbb{R}, x \geq -1.$$

- (a) Express $f(x)$ in the form $a(x + b)^2 + c$. [2]
- (b) Describe fully two transformations that would map the graph of $y = x^2, x \geq 0$ onto the graph of $y = f(x)$. [3]
- (c) Find an expression for $f^{-1}(x)$ and state its domain. [4]
- (d) Sketch the graphs of $y = f(x)$ and $y = f^{-1}(x)$ on the same diagram and state the relationship between them. [4]

Total: 13

6.

$$f(x) = e^{3x+1} - 2, \quad x \in \mathbb{R}.$$

- (a) State the range of f . [1]

The curve $y = f(x)$ meets the y -axis at the point P and the x -axis at the point Q .

- (b) Find the exact coordinates of P and Q . [4]
- (c) Show that the tangent to the curve at P has the equation [4]

$$y = 3ex + e - 2.$$

- (d) Find to 3 significant figures the x -coordinate of the point where the tangent to the curve at P meets the tangent to the curve at Q . [4]

Total: 13

7. (a) Solve the equation [2]

$$\pi - 3 \arccos(\theta) = 0.$$

- (b) Sketch on the same diagram the curves [5]

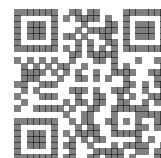
$$y = \arccos(x - 1), 0 \leq x \leq 2, \quad \text{and} \quad y = \sqrt{x + 2}, x \geq -2.$$

Given that α is the root of the equation

$$\arccos(x - 1) = \sqrt{x + 2},$$

- (c) show that $0 < \alpha < 1$, [3]
- (d) use the iterative formula [4]

$$x_{n+1} = 1 + \cos(\sqrt{x_n + 2})$$



with $x_0 = 1$ to find α correct to 3 decimal places.

Total: 14

