Solomon Practice Paper

Pure Mathematics 2K

Time allowed: 90 minutes

Centre: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	6	
2	7	
3	8	
4	9	
5	9	
6	11	
7	11	
8	14	
Total:	75	

How I can achieve better:

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1.	Find, to an appropriate degree of accuracy, the values of x and y for which	
	(a) $3^x = 11$,	[3]
	(b) $\log_2(2y-1) = 4$.	[3]
		Total: 6
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2. A sequence is defined as follows:

$$u_{n+1} = 3u_n + 2, \quad n \ge 1, \quad u_1 = k.$$

(a) Find expressions in terms of k for u_2 and u_3 . [3]

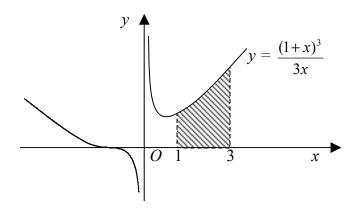
Given that $\sum_{r=1}^{4} u_r = 16$,

(b) find the value of k. [4] Total: 7

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3. Figure shows part of the curve with equation $y = \frac{(1+x)^3}{3x}$.



(a) Express $(1+x)^3$ as a series in ascending powers of x.

[2]

[6]

(b) Show that the area of the shaded region enclosed by the curve, the ordinates x=1 and x=3, and the x-axis is given by $\frac{1}{9}(3\ln(3)+80)$.

Total: 8

4.	The	fun	ction	f	is	given	by
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$$f: x \mapsto \frac{2}{x-3}, \quad x \in \mathbb{R}, \quad x \neq 3.$$

(a) Define $f^{-1}(x)$, stating its domain clearly.

[5]

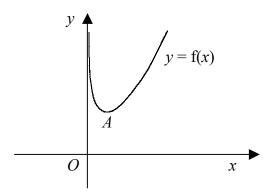
The function g is given by

$$g: x \mapsto x^2 - 6x + 1, \quad x \in \mathbb{R}, \quad x \ge k.$$

(b) Given that $g^{-1}(x)$ exists, find the minimum value of k .	[4]
	Total: 9

5. Figure shows part of the curve with equation y = f(x) where

$$f(x) \equiv 2e^x - \ln(x), \quad x \in \mathbb{R}, \quad x > 0.$$



(a) Find f'(x). [2]

A is the stationary point on the curve.

(b) Show that the x-coordinate of A lies in the interval (0.3, 0.4).

[3]

The point B lies on the curve and its x-coordinate is 1.

(c) Show that the equation of the tangent to the curve at B is

[4]

$$y = (2e - 1)x + 1.$$

tal: 9



Total: 11

6. Given that

$$p = \frac{3x - 4}{x + 1}$$
 and $q = \frac{x^2 - 6x}{x^2 - 1}$,

- (a) show that $p 2q = \frac{x+4}{x-1}$, [6]
- (b) find and simplify an expression for $\frac{p}{q}$ in terms of x, [3]
- (c) find the value or values of x for which $\frac{p}{q} = 0$.



7.	(a) Prove that for all values of x	[[5]
	$\cos^{2}(x) - \sin^{2}(2x) \equiv \cos^{2}(x)(4\cos^{2}(x) - 3).$		
	(b) Hence find the values of x in the interval $0 \le x \le 2\pi$, for which	[[6]
	$\cos^2(x) - \sin^2(2x) = 0,$		
	giving your answers in terms of π .		
		Total: 1	11
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- (a) By sketching the graphs $y = (x-3)^2$ and $y = \sqrt{x}$ on the same diagram, show that the equation $(x-3)^2 = \sqrt{x}$ has exactly two positive roots.
 - [4]

[5]

[5]

(b) Show that one root of the equation, α , lies in the interval $1 < \alpha < 2$, and find the value of N such that

$$\frac{N}{10} < \alpha < \frac{N+1}{10}.$$

(c) Using an iteration of the form $x_{n+1} = x_n^{\frac{1}{4}} + k,$

with a starting value of $x_1 = 4$, find the other root of the equation, β , correct to 3 significant figures.

Total: 14



