## Solomon Practice Paper

Pure Mathematics 2A

Time allowed: 90 minutes

Centre: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	5	
2	7	
3	7	
4	8	
5	10	
6	11	
7	12	
8	15	
Total:	75	

## How I can achieve better:

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[5]

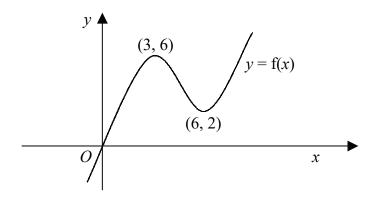
1.	By letting $y = 2^x$ , or otherwise, solve the equation
	$2^{2x} - 2^x - 6 = 0$
	giving any answers correct to 3 significant figures.

2.	a) Expand $(1-3x)^6$ in ascending powers of $x$ as far as the term in $x^3$ , simplifying the coefficient in each term.		
	Using your series, together with a suitable value of $x$ which you should state, estimate the value of $(0.997)^6$ correct to 6 significant figures.	[3]	
		Total: 7	

Last updated: May 5, 2023

3.	(a) Show that $(x + 2)$ is a factor of $(x^3 - 2x^2 - 5x + 6)$ .	[2]
	(b) Hence, simplify the expression $x^3 - 2x^2 - 5x + 6$	[5]
	$\frac{x^3 - 2x^2 - 5x + 6}{2x^2 - 5x - 3}$	
		Total: 7

4. Figure shows part of the curve y = f(x) which passes through the origin, O.



The curve has a maximum point with coordinates (3,6) and a minimum point with coordinates (6,2).

Showing the coordinates of any stationary points, sketch on separate diagrams the curves

(a) y = f(x+3),

[2]

(b) y = f(2x),

[4]

[2]

(c) y = f(|x|).

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Total: 10

5.

$$f(x) \equiv 1 + \frac{3}{x}, \quad x \in \mathbb{R}, \quad x \neq 0.$$

- (a) Show that  $ff(x) = \frac{4x+3}{x+3}$ . [4]
- (b) Prove that the equation f(x) = kx + 2k will only have real solutions if  $4k^2 + 8k + 1 \ge 0$ . [4]
- (c) Prove by counter-example that the equation f(x) = kx + 2k does not have real solutions for all values of k.

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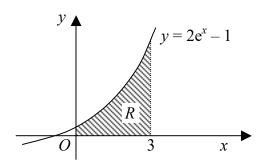
6.	(a) Prove that for all values of $x$	[5]
	$2\tan(x) - \sin(2x) \equiv 2\sin^2(x)\tan(x).$	
	(b) Hence find the values of $x$ in the interval $0 \le x \le 360^{\circ}$ , for which	[6]
	$2\tan(x) - \sin(2x) = \sin^2(x),$	
	giving your answers to an appropriate degree of accuracy.	
	Total	al: 11

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[5]

Total: 12

7. Figure shows part of the curve with equation  $y = 2e^x - 1$ .



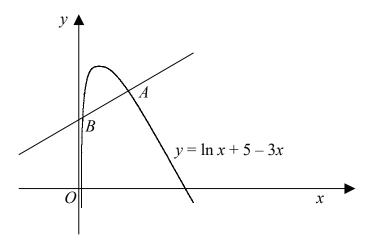
The shaded region, R, is enclosed by the curve, the positive coordinate axes and the ordinate x = 3.

(a) Use the trapezium rule with 4 equally spaced ordinates to estimate the area of R, giving your answer in terms of e.

(b) Use integration to show that the exact area of R is  $2e^3 - 5$ . [4]

(c) Find correct to 2 significant figures the percentage error in your estimate in part (a). [3]

8. Figure shows part of the curve  $y = \ln(x) + 5 - 3x, x > 0$ , and the normal to the curve at the point A.



The x-coordinate of the point A is 1.

- (a) Find the equation of the normal to the curve at A in the form ax + by + c = 0.
- (b) Show that the x-coordinate of the point B, where the normal again intersects the curve is given by a solution of the equation  $2\ln(x) + 7 7x = 0$ .
- (c) Using an iteration of the form  $x_{n+1} = e^{k(x_n 1)},$  [5]

with a starting value of  $x_1 = 0.1$ , find the x-coordinate of the point B giving your answer correct to 3 decimal places.




[7]

Total: 15