Solomon Practice Paper

Pure Mathematics 2L

Time allowed: 90 minutes

Centre: www.CasperYC.club

Name:

Teacher:

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

How I can achieve better:

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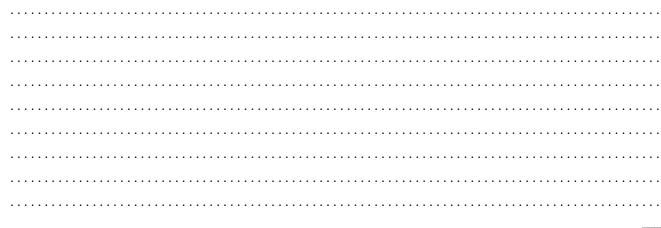


- 1. (a) Sketch the following graphs on separate diagrams, labelling the coordinates of any points where each graph meets the coordinate axes. [4]
 - i. y = |x + 1|.
 - ii. y = |x| + 1.
 - (b) Hence, write down the set of values of x for which

[1]

$$|x| + 1 > |x + 1|$$
.

Total: 5





2.	(a) Prove by counter-example that $a > b$ does not imply that $(a+1)^2 > (b+1)^2$ for all integer a and b .	rs [2]
	(b) Use proof by contradiction to show that $(4n-3)$ is odd for all positive integers n .	[4] Total: 6
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3.	(a) Expand $\left(1+\frac{1}{4}x\right)^8$ in ascending powers of x as far as the term in x^3 , simplifying the coefficient in each term.	[4]
	(b) Use your series to estimate the value of $\left(\frac{41}{40}\right)^8$, correct to 4 significant figures.	[3]
	(40)	Total: 7
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1.	(a) Show that for all values of x , where x is measured in degrees,	[5]
	$\cos(x + 60^{\circ}) - \sqrt{3}\sin(x - 60^{\circ}) \equiv 2\cos(x) - \sqrt{3}\sin(x).$	
	(b) Hence, find the values of x in the interval $-180^{\circ} \le x \le 180^{\circ}$, for which	[4]
	$\cos(x + 60^{\circ}) - \sqrt{3}\sin(x - 60^{\circ}) = 0,$	
	giving your answers to an appropriate degree of accuracy.	
		Total: 9

5.

$$f(x) \equiv 2 - \frac{3}{x}, \quad x \in \mathbb{R}, \quad x \neq 0.$$

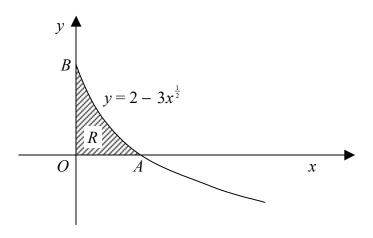
(a) Find and simplify an expression for $ff(x)$ and state its domain.	[5]
(b) Show that $fff(x) = \frac{4x+3}{6-x}$.	[4]
	Total: 9



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6. Figure shows the curve with equation $y = 2 - 3x^{\frac{1}{2}}$.



The curve meets the x-axis at the point A and the y-axis at the point B.

(a) Find the coordinates of the points A and B.

[3]

[7]

The shaded region, R, is bounded by the curve and the positive coordinate axes.

(b) Show that the volume generated when R is rotated through 360° about the x-axis is $\frac{8}{27}\pi$.

pout [2]

Total: 12

(c) State, with a reason, whether the volume generated when R is rotated through 360° about the y-axis is more, less or the same as your answer to part (b).



[5]

[2]

Total: 12

7.

$$f(x) \equiv \arccos(x), \quad x \in \mathbb{R}, \quad |x| \le 1.$$

- (a) State the exact value of x for which $f(x) = \frac{3}{4}\pi$. [2]
- (b) Sketch the curve y = f(x) and state its range. [3]
- (c) Use the trapezium rule with 3 equally spaced ordinates to estimate the area enclosed by the curve y = f(x) and the positive coordinate axes. Give your answer in the form $k\pi$ where k is an exact fraction.
- (d) Explain, with reference to the curve's symmetry, why the total area enclosed by the curve, the x-axis and the ordinate x = -1 is π .

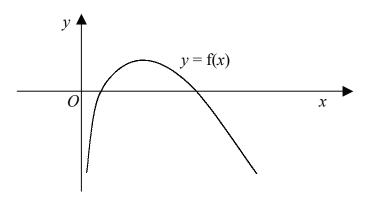
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8. Figure shows the curve y = f(x) where $f(x) \equiv \ln(5x) - 2x^2, x > 0$.



(a) Show that the maximum value of f(x) is $\ln\left(\frac{5}{2}\right) - \frac{1}{2}$. [5]

The point A lies on the curve and has x-coordinate $\frac{1}{5}$.

- (b) Show that the equation of the tangent to the curve at A is 105x 25y 23 = 0.
- (c) Show that that the equation f(x) = 0 can be rearranged to give $x = \frac{1}{4} \left(e^{2x^2} x \right)$. [2]
- (d) Use the iteration formula $x_{n+1} = \frac{1}{4} \left(e^{2x_n^2} x \right)$ [3]

with $x_0 = 0.25$ to find x_1, x_2 and x_3 .

Hence, write down one root of the equation f(x) = 0 correct to an appropriate degree of accuracy.



[5]

Total: 15

