

Solomon Practice Paper

Pure Mathematics 4D

Time allowed: 90 minutes

Centre: www.CasperYC.club

Name:

Teacher:

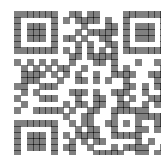
| Question | Points | Score |
|----------|--------|-------|
| 1 | 7 | |
| 2 | 8 | |
| 3 | 8 | |
| 4 | 10 | |
| 5 | 10 | |
| 6 | 15 | |
| 7 | 17 | |
| Total: | 75 | |

How I can achieve better:

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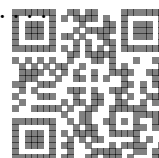
Last updated: May 5, 2023



$$f(x) \equiv 3x^3 + kx^2 + 42x + k,$$

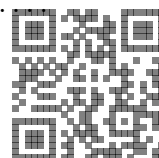
Given that $(3 + \mathbf{i})$ is a root of the equation $f(x) = 0$,

- (a) find a quadratic factor of $f(x)$, [3]
- (b) find the value of k . [4]



[8]

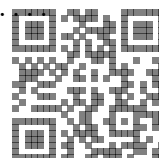
$$\frac{x}{x-1} > \frac{2}{3-x}.$$



[8]

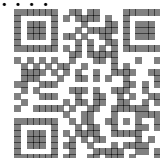
$$\frac{dy}{dx} - 3x + 4xy = 0,$$

giving your answer in the form $y = f(x)$.



- $$\sum_{r=1}^n \frac{3r+4}{r(r+1)(r+2)} = \frac{n(5n+9)}{2(n+1)(n+2)}.$$

Total: 10



- $$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 10y = 5x^2 - 13x + 1.$$

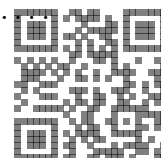
- Total: 10

6.

$$f(x) \equiv \frac{2}{3}x + \sin(2x) - 1, \quad x \in \mathbb{R}.$$

- (a) By sketching the graphs of $y = \sin(2x)$ and $y = 1 - \frac{2}{3}x$ on the same diagram, find the number of solutions to the equation $f(x) = 0$. [3]
- (b)
 - i. Show that one root, α , of the equation $f(x) = 0$ lies in the interval $(2.5, 3)$. [7]
 - ii. Use one application of the method of linear interpolation on this interval to find an approximate value for α , giving your answer correct to 2 decimal places.
 - iii. Determine whether or not your answer to part (ii) gives the value of α correct to 2 decimal places.
- (c) Use the Newton-Raphson method with a starting value of $x = 0.5$ to find another root of the equation $f(x) = 0$ correct to 3 significant figures. [5]

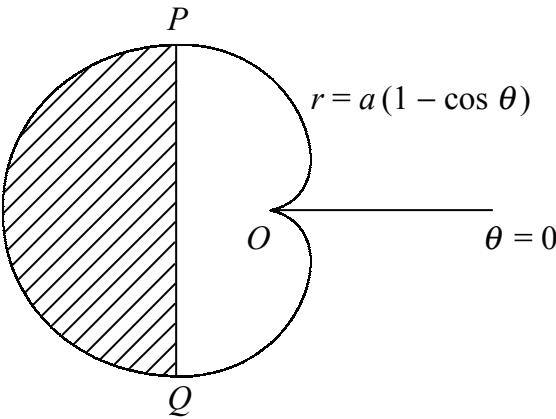
Total: 15

This image shows a full page of white paper with horizontal dotted lines, typical of notebook paper. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

7. Figure shows the curve C with polar equation

$$r = a(1 - \cos(\theta)), \quad 0 \leq \theta < 2\pi,$$

where a is a positive constant.



At the points P and Q the tangents to the curve are parallel to the initial line $\theta = 0$.

(a) Find the polar coordinates of P and Q . [7]

The shaded region is bounded by the curve C and the straight line PQ .

(b) Show that the area of the shaded region is $\frac{1}{16}a^2(8\pi + 9\sqrt{3})$. [10]

Total: 17

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