**Solomon Practice Paper**

**Core Mathematics 2G**

**Time allowed:** 90 **minutes**

| Question | Points | Score |
|---|---|---|
| 1 | 5 | |
| 2 | 6 | |
| 3 | 6 | |
| 4 | 7 | |
| 5 | 8 | |
| 6 | 8 | |
| 7 | 11 | |
| 8 | 12 | |
| 9 | 12 | |
| Total: | 75 | |

**Centre:** www.CasperYC.club

**Name:**

**Teacher:**

**How I can achieve better:**

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Last updated: May 5, 2023

1. Evaluate [5]

$$\int_{-2}^{0} (3x-1)^2 \, \mathrm{d}x.$$

2.

$$\mathrm{f}(x) = x^3 + kx - 20.$$

Given that $\mathrm{f}(x)$ is exactly divisible by $(x + 1)$,

(a) find the value of the constant $k$, [2]

(b) solve the equation $\mathrm{f}(x) = 0$. [4]

Total: 6

3. (a) Given that [2]

$$5\cos(\theta) - 2\sin(\theta) = 0,$$

show that $\tan(\theta) = 2.5$.

(b) Solve, for $0 \leq x \leq 180$, the equation [4]

$$5\cos(2x^\circ) - 2\sin(2x^\circ) = 0,$$

giving your answers to 1 decimal place.

Total: 6

4. Solve each equation, giving your answers to an appropriate degree of accuracy.

   (a) $3^{x-2} = 5$. [3]

   (b) $\log_2(6 - y) = 3 - \log_2(y)$. [4]

Total: 7

5. A geometric series has third term 36 and fourth term 27. Find

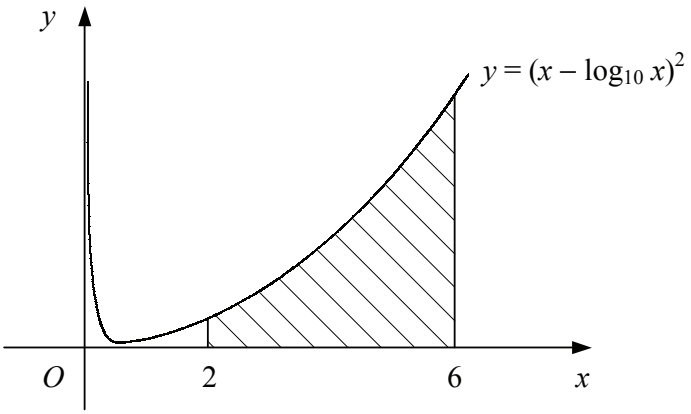
   (a) the common ratio of the series, [2]

   (b) the fifth term of the series, [2]

   (c) the sum to infinity of the series. [4]

Total: 8

6. Figure shows the curve with equation $y = (x - \log(x))^2, x > 0$.




(a) Copy and complete the table below for points on the curve, giving the y values to 2 decimal places. [2]

| $x$ | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| $y$ | 2.89 | 6.36 | | | |

The shaded area is bounded by the curve, the $x$-axis and the lines $x = 2$ and $x = 6$.

(b) Use the trapezium rule with all the values in your table to estimate the area of the shaded region. [4]

(c) State, with a reason, whether your answer to part (b) is an under-estimate or an over-estimate of the true area. [2]

Total: 8

7.

$$\mathrm{f}(x) = 2 + 6x^2 - x^3.$$

(a) Find the coordinates of the stationary points of the curve $y = \mathrm{f}(x)$. [5]

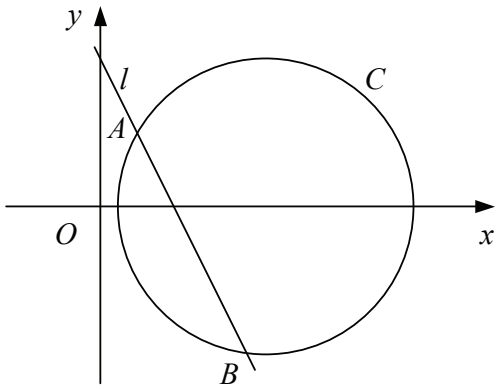
(b) Determine whether each stationary point is a maximum or minimum point. [3]

(c) Sketch the curve $y = \mathrm{f}(x)$. [2]

(d) State the set of values of $k$ for which the equation $\mathrm{f}(x) = k$ has three solutions. [1]

Total: 11

8. Figure shows the circle $C$ and the straight line $l$.




The centre of $C$ lies on the $x$-axis and $l$ intersects $C$ at the points $A(2, 4)$ and B $(8, -8)$.

(a) Find the gradient of $l$. [2]

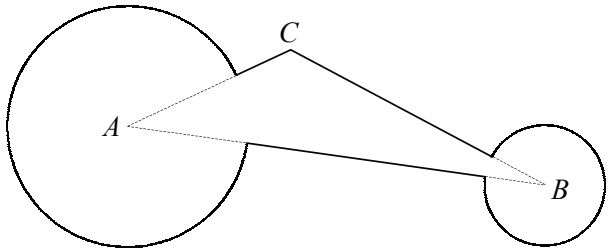
(b) Find the coordinates of the mid-point of $AB$. [2]

(c) Find the coordinates of the centre of $C$. [5]

(d) Show that $C$ has the equation $x^2 + y^2 - 18x + 16 = 0$. [3]

Total: 12

9. Figure shows a design painted on the wall at a karting track.




The sign consists of triangle $ABC$ and two circular sectors of radius 2 metres and 1 metre with centres $A$ and $B$ respectively.

Given that $AB = 7$ m, $AC = 3$ m and $\angle ACB = 2.2$ radians,

(a) use the sine rule to find the size of $\angle ABC$ in radians to 3 significant figures, [3]

(b) show that $\angle BAC = 0.588$ radians to 3 significant figures, [2]

(c) find the area of triangle $ABC$, [2]

(d) find the area of the wall covered by the design. [5]

Total: 12