

Solomon Practice Paper

Pure Mathematics 3A

Time allowed: 90 minutes

Centre: www.CasperYC.club

Name:

Teacher:

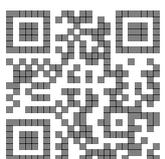
Question	Points	Score
1	6	
2	7	
3	8	
4	8	
5	9	
6	11	
7	13	
8	13	
Total:	75	

How I can achieve better:

-
-
-



Last updated: May 5, 2023



1. A curve has the equation $y = x^2e^{3x}$.

(a) Find and simplify an expression for $\frac{dy}{dx}$. [3]

(b) Find the coordinates of any stationary points on the curve. [3]

Total: 6

2.

$$f(x) \equiv x^3 + ax + 2.$$

Given that the remainder when $f(x)$ is divided by $(x + 2)$ is the same as the remainder when $f(x)$ is divided by $(x - 3)$,

(a) find the value of a , [4]

(b) find as an exact fraction the remainder when $f(x)$ is divided by $(2x - 5)$. [3]

Total: 7

3. (a) Expand $(1 + 2x)^{\frac{1}{2}}$ in ascending powers of x as far as the term in x^3 , simplifying each coefficient. [4]

(b) State the set of values of x for which your series is valid. [1]

(c) Use your series with a suitable value of x to estimate the value of $\sqrt{1.02}$ correct to 6 significant figures. [3]

Total: 8

4.

$$f(x) \equiv \frac{5}{(3x - 2)(x + 1)}.$$

(a) Express $f(x)$ in the form [3]

$$\frac{A}{3x - 2} + \frac{B}{x + 1}.$$

(b) Show that [5]

$$\int_2^4 f(x) dx = \ln\left(\frac{3}{2}\right).$$

Total: 8

5. The circle C has the equation

$$x^2 + y^2 - 4x - 10y + 20 = 0.$$

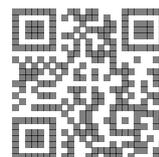
(a) Find the coordinates of the centre of C and write down its radius. [5]

(b) Find an equation for the smallest circle that touches both the circle C and the x -axis. [4]

Total: 9

6. A curve has the equation

$$2x^2y - 6y + x^3 = 2.$$



(a) Show that

$$\frac{dy}{dx} = \frac{3x^2 + 4xy}{6 - 2x^2}.$$

[5]

The point A with coordinates $(2, k)$ lies on the curve.

(b) Find the value of k .

[2]

(c) Show that the normal to the curve at A has the equation

[4]

$$x + 6y + 16 = 0.$$

Total: 11

7. (a) Using the substitution $u = \sin(x)$, or otherwise, find

[4]

$$\int \cos(x) \sin^2(x) dx.$$

(b) Hence, find

[3]

$$\int \cos^3(x) dx.$$

(c) Given that $y = \frac{\pi}{4}$ when $x = \frac{\pi}{6}$, solve the differential equation

[6]

$$\frac{dy}{dx} = \cos^2(y) \cos^3(x).$$

Total: 13

8. Relative to a fixed origin, O , the points A and B have position vectors $(7\mathbf{i} - 7\mathbf{j} + 5\mathbf{k})$ and $(\mathbf{i} - 6\mathbf{j} + 12\mathbf{k})$ respectively.

(a) Find, in vector form, an equation of the line l which passes through A and B .

[3]

Given that the point C has position vector $(-3\mathbf{i} + 12\mathbf{j} + 10\mathbf{k})$ and that M is the mid-point of BC ,

(b) find the position vector of the point M .

[3]

Given also that $ABMD$ is a rhombus,

(c) show that the position vector of the point D is $(5\mathbf{i} + 2\mathbf{j} + 4\mathbf{k})$,

[2]

(d) find the area of $ABMD$ in the form $k\sqrt{2}$ where k is an integer.

[5]

Total: 13

