

Solomon Practice Paper

Core Mathematics 4G

Time allowed: 90 minutes

Centre: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	6	
2	7	
3	8	
4	9	
5	9	
6	10	
7	11	
8	15	
Total:	75	

How I can achieve better:

-
-
-



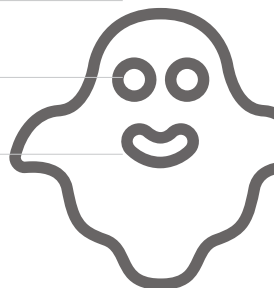
Last updated: July 14, 2025



[6]

Find an expression for $\frac{dy}{dx}$ in terms of x and y .

Find an expression for $\frac{dy}{dx}$ in terms of x and y .



2. Use integration by parts to find

[7]

$$\int x^2e^{-x} \, dx.$$

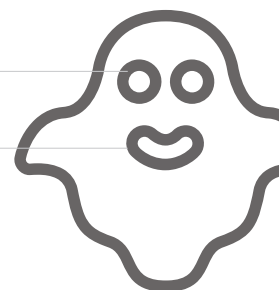


$$1 - 4x + 24x^2 + kx^3,$$

[6]

[2]

Total: 8



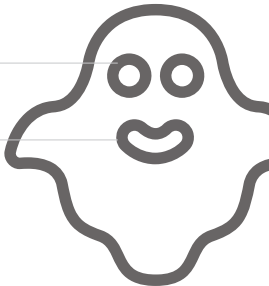
4. (a) Use the trapezium rule with two intervals of equal width to find an estimate for the value of the integral [5]

$$\int_0^3 e^{\cos(x)} \, dx,$$

giving your answer to 3 significant figures.

- (b) Use the trapezium rule with four intervals of equal width to find another estimate for the value of the integral to 3 significant figures. [2]
- (c) Given that the true value of the integral lies between the estimates made in parts (a) and (b), comment on the shape of the curve $y = e^{\cos(x)}$ in the interval $0 \leq x \leq 3$ and explain your answer. [2]

Total: 9



$$(9\mathbf{i} - 8\mathbf{j} + 2\mathbf{k}) \quad \text{and} \quad (4\mathbf{j} + \mathbf{k})$$

The road ends at a junction at the point C with another straight road which lies along the line with equation

$$\mathbf{r} = (2\mathbf{i} + 16\mathbf{j} - \mathbf{k}) + \mu(-5\mathbf{i} + 3\mathbf{j}),$$

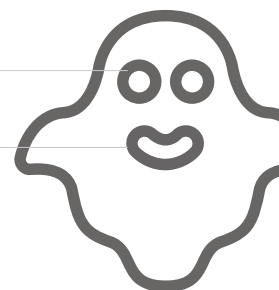
(a) Find the position vector of C .

[5]

(b) find the distance, in kilometres, from the village at A to the junction at C .

[4]

Total: 9

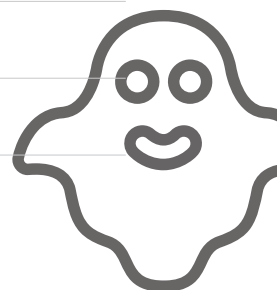


In a model, it is assumed that the population of the town, P , at time t years after 2001 satisfies the differential equation

$$\frac{dP}{dt} = 0.05Pe^{-0.05t}.$$

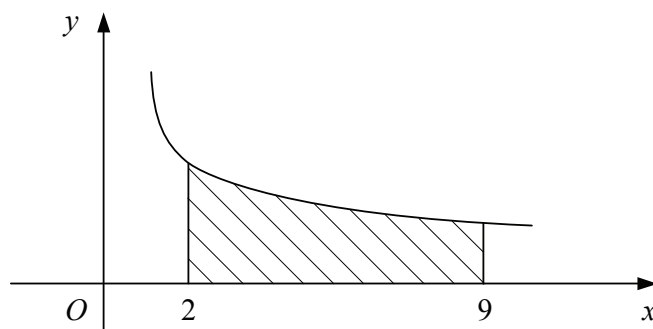
- Show that, according to the model, the population of the town in 2011 will be 13300 to 3 significant figures. [7]
- Find the value which the population of the town will approach in the long term, according to the model. [3]

Total: 10



7. Figure shows the curve with parametric equations

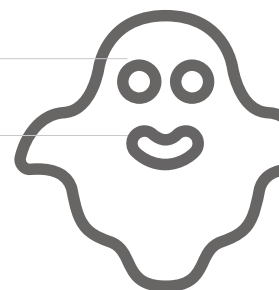
$$x = t^3 + 1, \quad \text{and} \quad y = \frac{2}{t}, \quad t > 0.$$



The shaded region is bounded by the curve, the x -axis and the lines $x = 2$ and $x = 9$.

- (a) Find the area of the shaded region. [5]
- (b) Show that the volume of the solid formed when the shaded region is rotated through 2π radians about the x -axis is 12π . [3]
- (c) Find a Cartesian equation for the curve in the form $y = f(x)$. [3]

Total: 11





8. (a) Show that the substitution $u = \sin(x)$ transforms the integral

[4]

$$\int \frac{6}{\cos(x)(2 - \sin(x))} dx$$

into the integral

$$\int \frac{6}{(1 - u^2)(2 - u)} du.$$

- (b) Express

[4]

$$\frac{6}{(1 - u^2)(2 - u)}$$

in partial fractions.

- (c) Hence, evaluate

[7]

$$\int_0^{\frac{\pi}{6}} \frac{6}{\cos(x)(2 - \sin(x))} dx,$$

giving your answer in the form $a \ln(2) + b \ln(3)$, where a and b are integers.

Total: 15

