



Just what the Doctor ordered

*Any solution based entirely on graphical
or numerical methods is not acceptable*

Marks Available : 40

Question 1

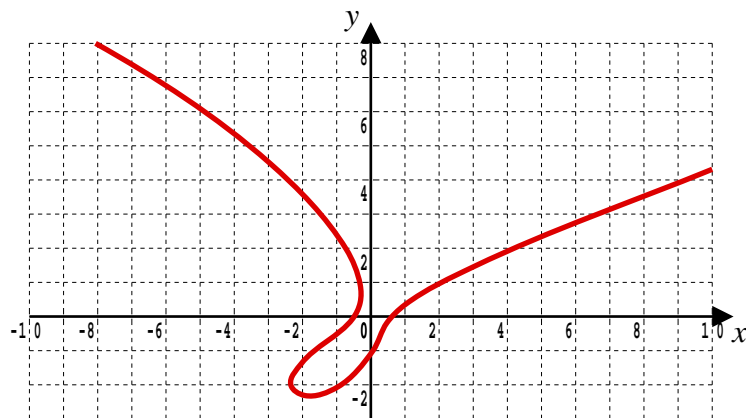
Solve the equation,

$$2^{2x+1} - 17 \times 2^x + 2^3 = 0$$

[4 marks]

Question 2

The curve shown has equation $3x^2 - y^3 - 5xy = 1$



Find the numerical value of the gradient of the curve at the point $(2, 1)$

[5 marks]

Question 3

The number of daylight hours, h , in England, d days after the spring equinox (the day in spring when the number of daylight hours is 12) is modelled by,

$$h = 12 + \frac{9}{2} \sin\left(\frac{2\pi}{365} d\right)$$

- (i) Find the number of daylight hours 25 days after the spring equinox. Give your answer in hours and minutes.

[2 marks]

- (ii) What is the maximum possible number of daylight hours, according to the model ? Give your answer in hours and minutes.

[1 mark]

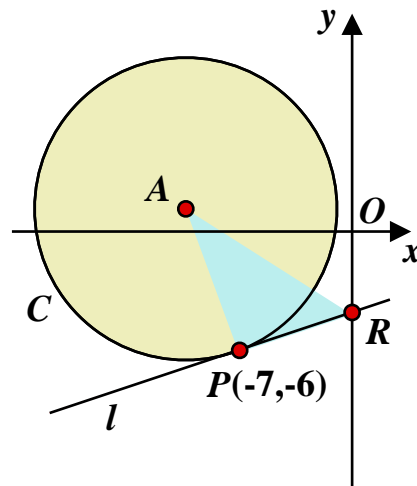
- (iii) How many days after the spring equinox, does this maximum number of daylight hours occur ?

[1 mark]

- (iv) For how many days of the year does the model suggest the number of daylight hours exceeds 15 hours. Give your answer as a whole number of days.

[4 marks]

Question 4



The circle C has equation $x^2 + 18x + y^2 - 2y + 29 = 0$

(i) Verify the point $P(-7, -6)$ lies on C .

[2 marks]

(ii) Find an equation for the tangent to C at the point P , giving your answer in the form $y = mx + c$

[4 marks]

(iii) Find the area of the triangle APR

[4 marks]

Question 5

The second term of a geometric sequence is 4, and the sixteenth term of the same sequence is 9. The common ratio is r , where $r > 0$.

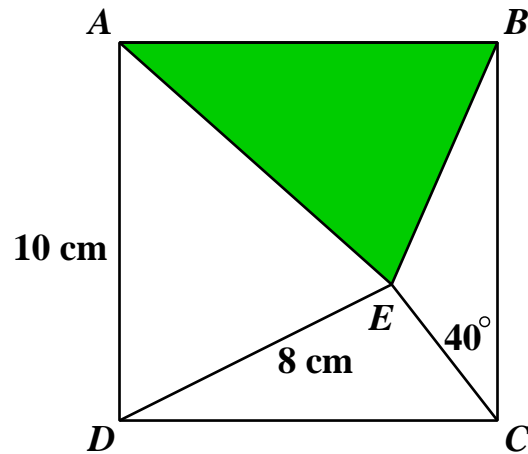
(i) Show that r satisfies the equation, $14 \ln r + \ln\left(\frac{4}{9}\right) = 0$

[3 marks]

(ii) Hence, or otherwise, find the value of r correct to 3 significant figures.

[3 marks]

Question 6



$ABCD$ is a square.
Angle CED is obtuse.
Find the area of the shaded triangle.

[7 marks]

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Teachers may obtain detailed worked solutions to the exercises by email from MHShrewsbury@gmail.com