Year 2 Pure Mathematics Examination Revision : Health Check N° 2

Monitoring Your Math's Vibrant Signs

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

Marks Available : 30

Question 1

Given that $f(x) = \left(x + \frac{1}{x}\right)^2$ determine the exact value of $\int_1^3 f(x)\,dx$

[5 marks]

Question 2

In March 2020, is was reported that the WhatsApp mobile messaging software had 2 billion active users. It was in March 2014 that it had 1 billion active users.

Y (Year)	U (Billion Users)
2014	1
2020	2

The growth in the number of active users was described as being exponential.

(i) Assuming that the relationship between the number of active users, U (billions) and the Year Number, is of the form

$$U = a\,e^{b(Y-2014)}$$ where a and b are constants

determine the value of a and the value of b

[2 marks]

(ii) Use your part **(i)** formula to predict the number of active WhatsApp users in March 2050.

[2 marks]

(iii) State with a reason if you think the prediction given by part (ii) is a realistic possibility or not.

[2 marks]

Question 3

Natalie is revising Calculus, and reads in her notes that;

Point of Inflexion

At a point of inflexion:

1st Condition • $\frac{d^2y}{dx^2}$ must equal zero

2nd Condition • $\frac{d^2y}{dx^2}$ must have different signs either side of the point

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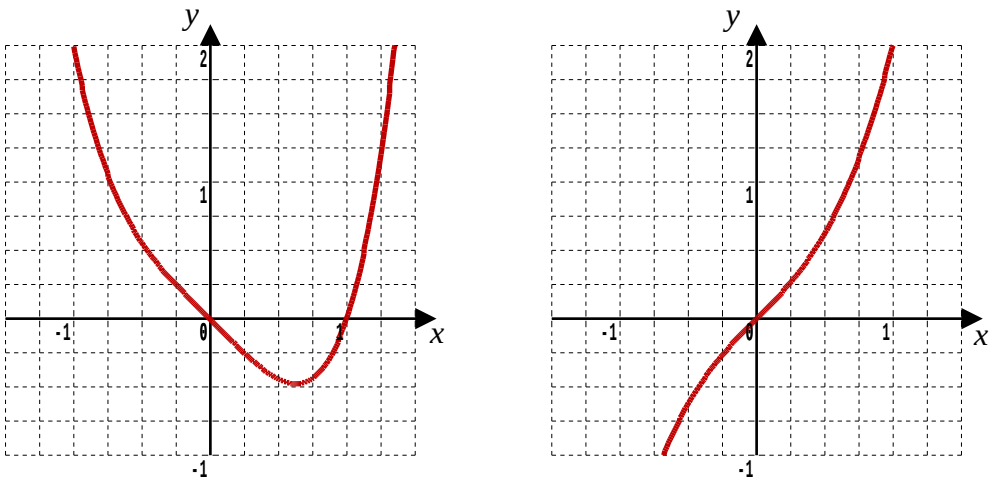
Shown are the graphs of $y = x^4 - x$ (to the left) and $y = x^3 + x$ (to the right)



(i) Show that $y = x^4 - x$ does not have a point of inflection at $(0, 0)$

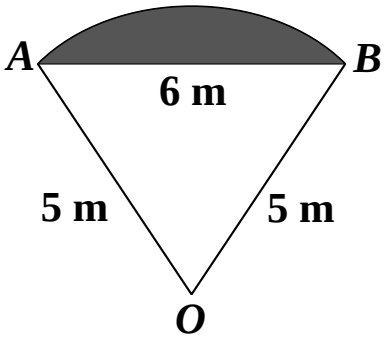
[3 marks]

(ii) Show that $y = x^3 + x$ has a point of inflection at $(0, 0)$

[3 marks]

Question 4

A-Level Examination Question from January 2006, Paper C2, Q5 (Edexcel)



OAB is a sector of a circle, radius 5 m
The chord *AB* is 6 m long

(a) Show that $\cos AOB = \frac{7}{25}$

[2 marks]

(b) Hence find the angle *AOB* in radians.
Give your answer to 3 decimal places.

[1 mark]

(c) Calculate the area of the sector *OAB.*

[2 marks]

(d) Hence calculate the shaded area.

[3 marks]

Question 5

A-Level Examination Question from January 2018, Paper C12, Q10(i) (Edexcel)

Use the laws of logarithms to solve the equation

$$3\log_8 2 + \log_8(7 - x) = 2 + \log_8 x$$

[5 marks]