



Fortify Your Maths

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

Marks Available : 30

Question 1

Find the values of k for which $kx^2 + 8x + 5 = 0$ has distinct real roots, $k \in \mathbb{R}$

[3 marks]

Question 2

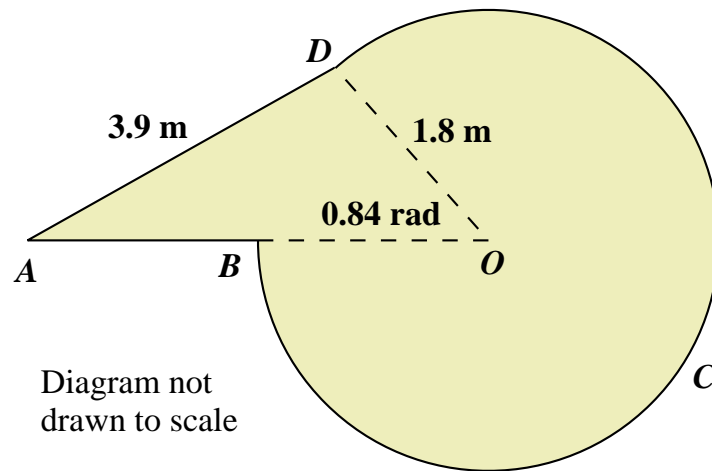
$f(x) = px^3 - 3px^2 + x^2 - 4$, where p is a constant

Given that, when $x = 2$, $f''(x) = -1$, find the value of p

[3 marks]

Question 3

A-Level Examination Question from January 2019, Paper C12, Q10b (Edexcel)



The diagram shows the design for a shop sign $ABCD$.

The sign consists of a triangle AOD joined to a sector of a circle $DOBCD$ with radius 1.8 m and centre O . The points A , B and O lie on a straight line. It is given that $AD = 3.9$ m and angle BOD is 0.84 radians.

- (a) Calculate the size of angle DAO , giving your answer in radians to 3 decimal places

[2 marks]

- (b) Show that, to one decimal place, the length of AO is 4.9 metres.

[3 marks]

- (c) Find, in m^2 , the area of the shop sign, giving your answer to one decimal place.

[3 marks]

- (d) Find, in metres, the perimeter of the shop sign, giving your answer to one decimal place

[3 marks]

Question 4

- (i) Given that $y = \frac{1}{4x + 1}$ find the value of $\frac{dy}{dx}$ when $x = \frac{1}{4}$

[3 marks]

- (ii) Hence find the equation of the tangent to the curve when $x = \frac{1}{4}$

[2 marks]

Question 5

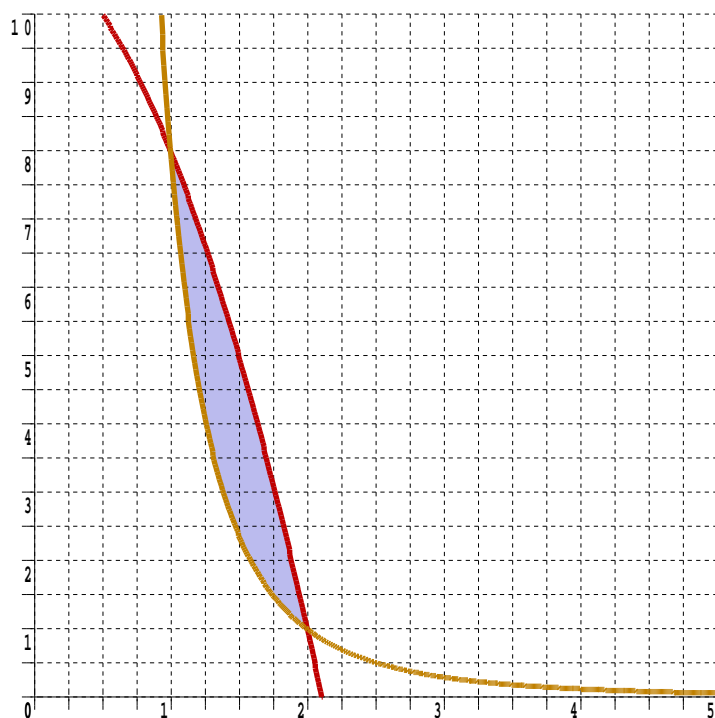
Given that $x = 3 \sin y$ $-\frac{\pi}{2} < y < \frac{\pi}{2}$

show that $\frac{dy}{dx} = \frac{1}{\sqrt{9 - x^2}}$

[4 marks]

Question 6

A-Level Examination Question from June 2017, Paper C2, Q6 (OCR)



The diagram shows parts of the curves $y = 11 - x - 2x^2$ and $y = \frac{8}{x^3}$

The curves intersect at $(1, 8)$ and $(2, 1)$

Use integration to find the exact area of the shaded region enclosed between the two curves.

[4 marks]

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Teachers may obtain detailed worked solutions to the exercises by email from MHHShrewsbury@Gmail.com