Additional Mathematics
Grade Gobbler 9

40 Mark Paper

Question 1

$$y = \frac{x^2 + 4x^5}{x^3}$$

Find $\frac{dy}{dx}$

[3 marks]

Question 2

(i) Expand the brackets;

$$\left(2x + \frac{1}{x}\right)^4$$

[4 marks]

(ii) Which term is independent of x ?

[1 mark]

(iii) In your expansion what is the coefficient of x^{-2} ?

[1 mark]

Question 3

The diameter of a circle has endpoints (3, 5) and (51, 19)

(i) What is the radius of the circle ?

[2 marks]

(ii) What are the coordinates of the centre of the circle ?

[2 marks]

(iii) Write down the equation of the circle in the form;

$$(x + p)^2 + (y + q)^2 = k$$

where p, q and k are constants to be determined.

[2 marks]

Question 4

A standard, unbiased, six sided die is rolled twelve times.

(i) How many times, on average, would you expect a *four* to be rolled ?

[1 mark]

(ii) Use the formula;

$$P(r\,fours) = {}^{n}C_r\, p^r\, q^{n-r}$$

to calculate the probability that exactly three of the twelve rolls are *four*.

[3 marks]

Question 5

$$f(x) = x^2 - 2x - 15$$

(i) Where does the graph of $y = f(x)$ cross the x-axis ?

[1 mark]

(ii) Sketch the general shape of the graph of $y = f(x)$
On your rough sketch, mark the x-axis crossing points found in part (i)

[1 mark]

(iii) Solve the $x^2 - 2x - 15 < 0$

[2 marks]

(iv) Solve the inequality $x^2 - 2x - 15 \geqslant 0$

[2 marks]

Question 6

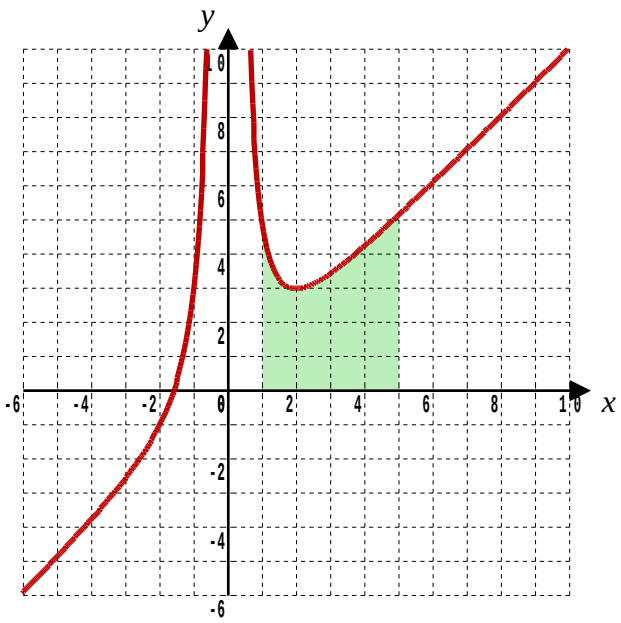
The diagram below shows, shaded, the area bounded by;

the x-axis

the line $x = 1$

the line $x = 5$

and the curve $y = x + \frac{4}{x^2}$



Use integration to find the exact area shaded.

[4 marks]

Question 7

(i) Write down the equation of the line perpendicular to the line with equation;

$$y = -\frac{1}{2}x + 6$$

and which passes through the point (5, 11)

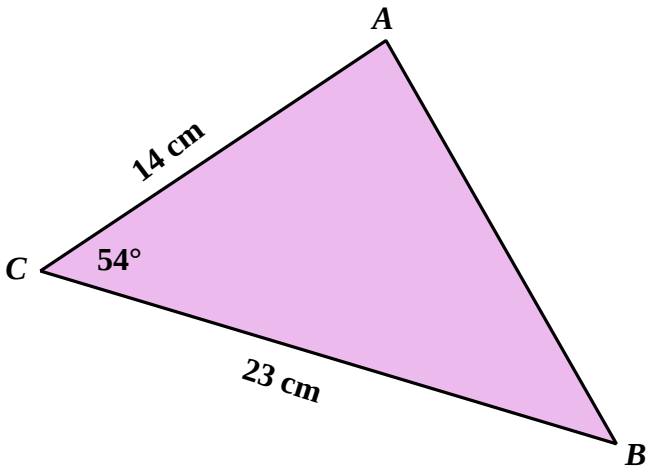
[2 marks]

(ii) What are the coordinates of the point where these two lines intersect ?

[2 marks]

Question 8

Calculate the length of *AB*



[3 marks]

Question 9

Find all of the turning points on the curve with equation;

$$y = \frac{1}{2}x^4 - 4x^2 + 3$$

clearly stating which are local minima and which are local maxima.

[4 marks]