

Additional Mathematics

Grade Gobbler 8

40 Mark Paper

Question 1

Solve the inequality

$$-13 \leq 5x + 7 \leq 42$$

[2 marks]

Question 2

(i) Differentiate;

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

[2 marks]

(ii) What is the value of the gradient on the curve $y = x^3 + 4x^{-2}$ at the point with coordinates (2, 9) ?

[2 marks]

(iii) Find the equation of the tangent to the curve $y = x^3 + 4x^{-2}$ at the point (2, 9).

Write your answer in the form $y = mx + c$

[2 marks]

Question 3

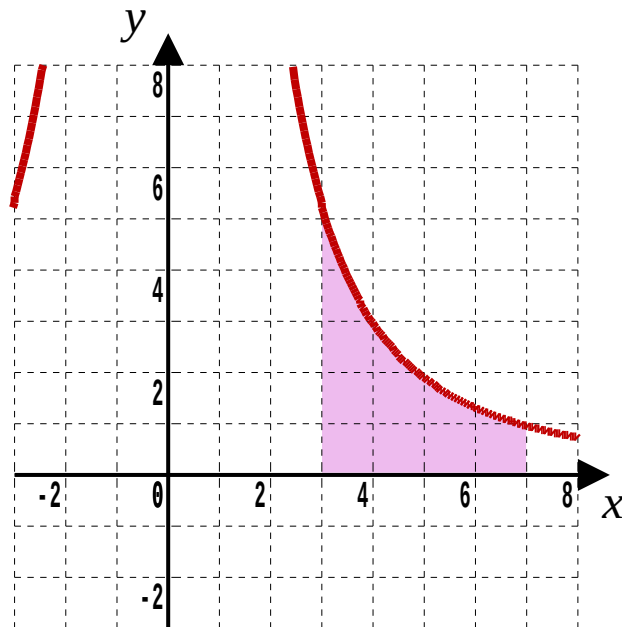
The diagram below shows, shaded, the area bounded by;

the x -axis

the line $x = 3$,

the line $x = 7$,

and the curve $y = \frac{48}{x^2}$



Use integration to find the area shaded.

[4 marks]

Question 4

The coordinates of two points A and B are $A(-2, -3)$ and $B(6, 9)$

- (i) Write down the coordinates of C , the mid-point between A and B

[1 mark]

- (ii) What is the gradient of the line through A and B ?

[1 mark]

- (iii) What is the gradient of any line perpendicular to the line through A and B ?

[1 mark]

- (iv) Determine the equation of the perpendicular bisector of the piece of line that lies between A and B .

[2 marks]

- (v) Write down the equation of the circle with centre C that has line AB as diameter.

[3 marks]

Question 5

A coin is biased such that, when tossed, the probability of it landing heads is 0.7
This coin is tossed twelve times.

Use the formula;

$$P(r \text{ heads}) = {}^nC_r p^r q^{n-r}$$

to calculate the probability that exactly seven of the twelve tosses are heads.

[4 marks]

Question 6

Equations of the form, $ax^2 + bx + c = 0$, (where a , b and c are constants),
can be solved by means of the formula;

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Show how to use this formula to find the two values of x that satisfy the equation;

$$x^2 + 4x - 18 = 0$$

Write your answers in the form;

$$x = p \pm \sqrt{q}$$

where p and q are integers and p is a prime and q square free.

[3 marks]

Question 7

$$f(x) = x^2 - 11x + 30$$

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

[2 marks]

- (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).

[2 marks]

- (iii) Solve the inequality $x^2 - 11x + 30 \leq 0$

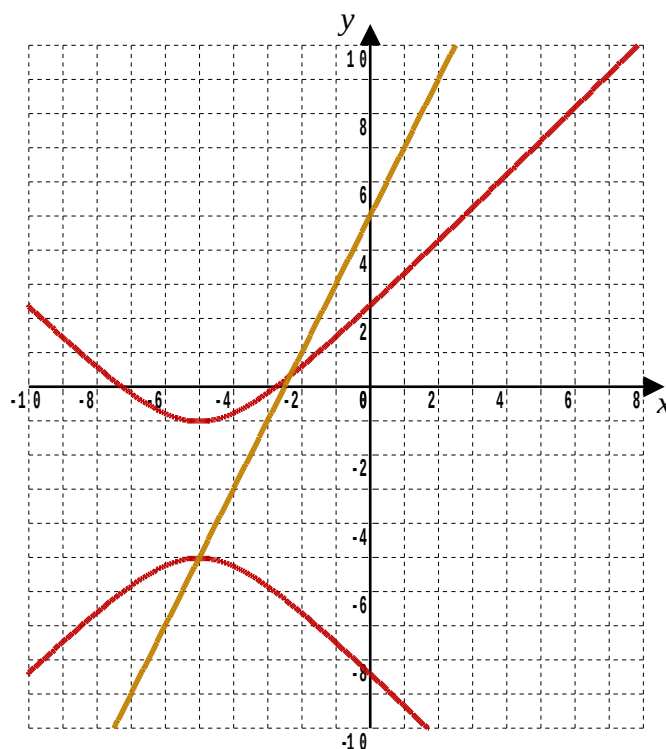
[2 marks]

- (iv) Solve the inequality $x^2 - 11x + 30 > 0$

[2 marks]

Question 8

On the graph below is plotted the straight line with equation, $y = 2x + 5$ and the hyperbola with equation, $(y + 3)^2 - (x + 5)^2 = 4$



Find the coordinates of the two points where the line and hyperbola intersect.
Give your answers accurate to 3 decimal places, where appropriate.

[5 marks]