MATHEMATICS: PAPER I

EXAMINATION NUMBER

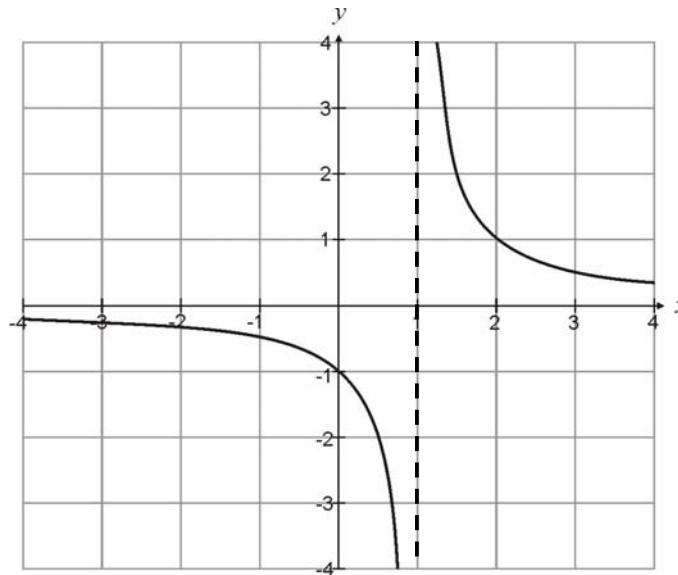Time: 3 hours   150 marks

ANSWER BOOKLET

QUESTION 5

(a)   Part of the graph of the function with equation $y = f(x)$ is shown below.

(1)   Give the equation of each asymptote.   (2)

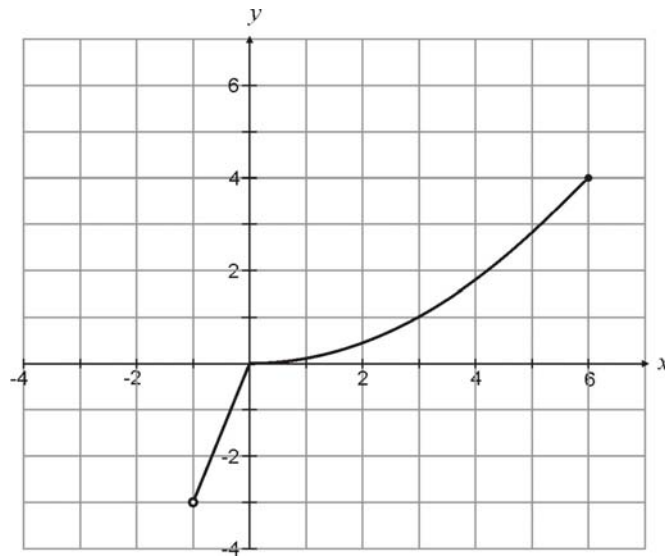_____

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(2)   On this set of axes, draw the graph of $y = f(-x)$ (2)

(b)   The graph of the function g is shown below.

(1)   Give the domain and range of the function.   (2)

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(2)   On this set of axes, draw the graph of the inverse function of g.   (4)

(3)   Explain why this inverse is a function.   (1)

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11 marks

QUESTION 6

Nutritionists have established that vitamins A, B_1 and B_2 are the most popular vitamins that people take to supplement their diets.
Research has shown that a person's daily requirement is at least 16 units of vitamin A, 5 units of B_1 and 20 units of B_2.
Two brands of vitamins are available: brand P and brand Q.
The table below summarises the units of each vitamin per tablet for each brand, and the cost per tablet.

	Vit. A	Vit. B_1	Vit. B_2	Cost per tablet
Brand P	8 units	1 unit	2 units	40c
Brand Q	2 units	1 unit	7 units	80c

Let x represent the number of tablets of brand P taken each day and y represent the number of tablets of brand Q taken each day.

The inequalities below summarise the information about a person's daily requirements of each vitamin mentioned above.
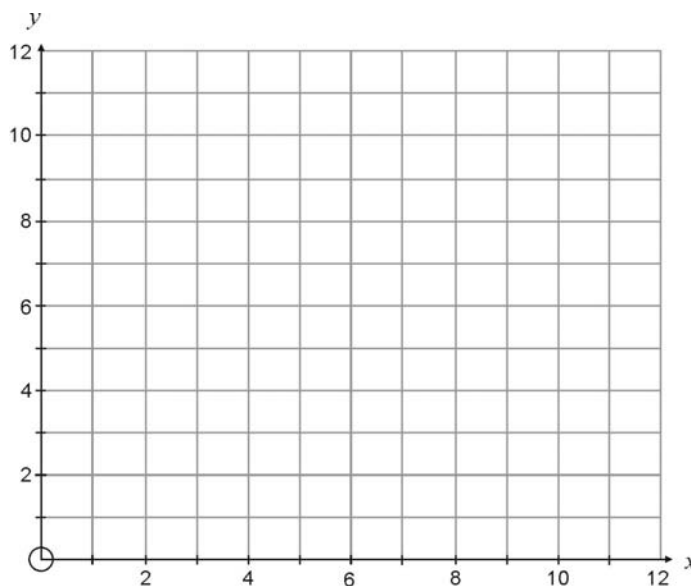
Vit. A: $8x + 2y \geq 16$
Vit. B_1: $x + y \geq 5$
Vit. B_2: $2x + 7y \geq 20$
Implicit constraints: $x \geq 0, \quad y \geq 0$

(a)   On the axes provided, draw the constraints and shade the feasible region.   (4)

(b)   State the objective function that represents the cost of the daily requirement of
         vitamins.   (1)

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(c)   Determine the values of x and y within the feasible region that will minimise the
         daily cost and calculate this minimum.   (4)

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(d)   Suppose brand Q decreased in price to 40c per tablet. Determine how this would
         effect the optimal solution and calculate the new minimum.   (3)

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(e)   Further research has shown that the daily requirement of vitamin B_1 is 6 units instead of 5 units as previously stated.

    (1)   Rewrite the constraint that is effected by this change.   (1)

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    (2)   Draw this constraint on the graph used in (a) and label it 'new vitamin B_1'.   (1)

    (3)   Determine the new optimal solution, using the objective function in (b).   (2)

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16 marks