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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 2 Mathematics, 2009

90285 Draw straightforward non-linear graphs

Credits: Three
9.30 am Monday 16 November 2009

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

Make sure you have the Formulae Sheet L2-MATHF.

Answer ALL the questions in this booklet.

The questions in this paper are NOT in order of difficulty. Attempt all questions or you may not provide enough evidence to achieve the required standard.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–10 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

For Assessor's use only	**Achievement Criteria**	
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Draw straightforward non-linear graphs. ☐	Draw non-linear graphs. ☐	Determine and apply an appropriate model for a situation involving graphs. ☐
	Use non-linear graphs to solve problems. ☐	
Overall Level of Performance (all criteria within a column are met) ☐		

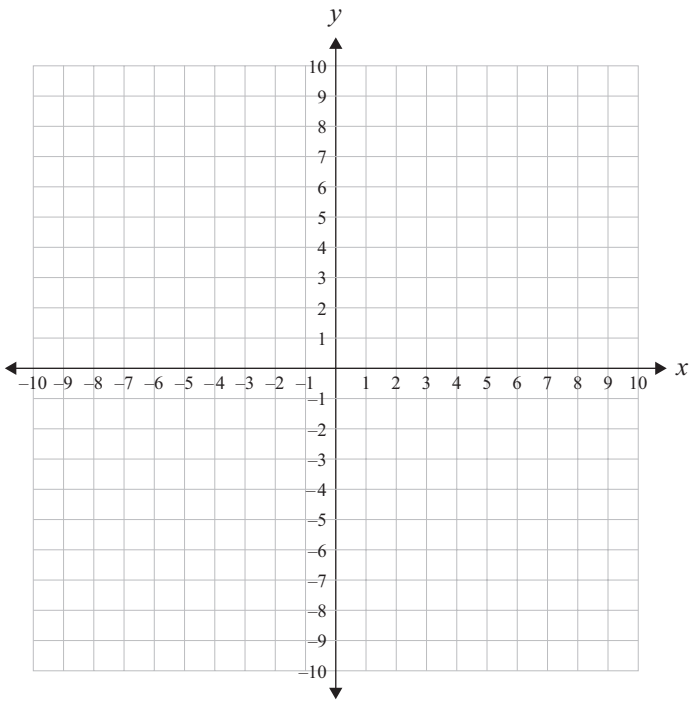
You are advised to spend 30 minutes answering the questions in this booklet.

Assessor's use only

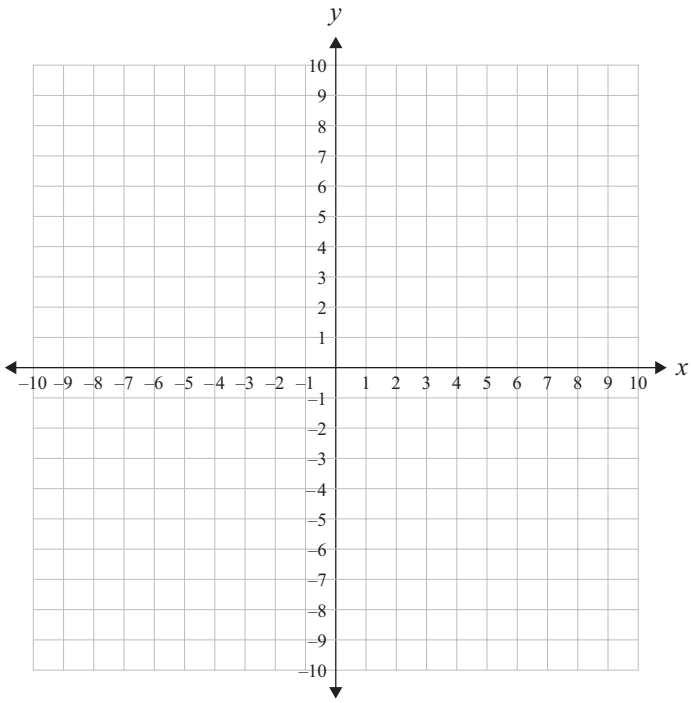
QUESTION ONE

(a) Draw the graph of $y = \dfrac{3}{2x}$, clearly showing any key features.

If you need to redraw either of these graphs, use the grids on page 8.

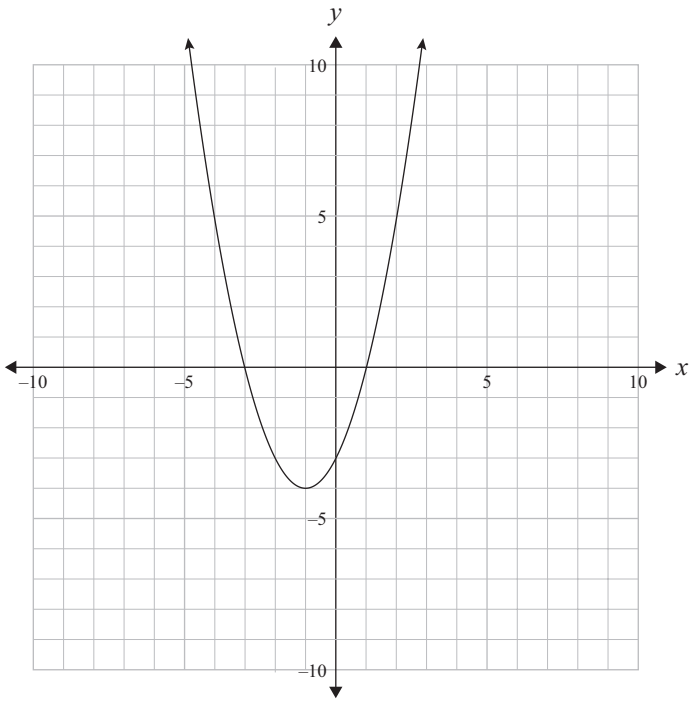


(b) Draw the graph of $y = \log_{10} x + 2$, clearly showing any key features.



Assessor's use only

(c) (i) Give the equation of the graph shown below.



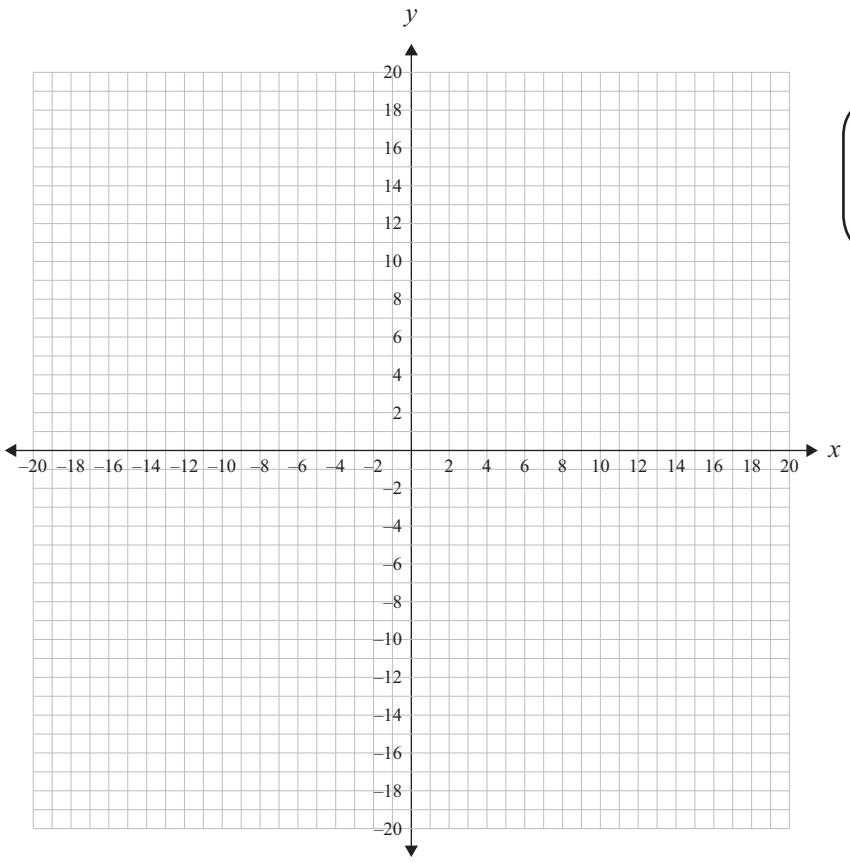
$y =$ _____

(ii) If this graph is translated so that its vertex is at (1,2), give the equation of the new graph, and find the y-intercept for this graph.

QUESTION TWO

Assessor's use only

(a) Draw the graph of $y = -x(x - 8)$, clearly showing any key features.



If you need to redraw this graph, use the grid on page 9.

(b) The monthly profit of a school Young Enterprise Scheme (YES) group is modelled by the function

$$y = -x(x - 8)$$

where x is the number of months that the group has been trading
and y is the profit **(in hundreds of dollars)** for the month.

(i) Find when the maximum monthly profit occurs, and calculate the maximum monthly profit (r) in hundreds of dollars.

(ii) On the grid above, used for part (a), sketch the graph of $(x - 4)^2 + y^2 = r^2$
where r is the maximum monthly profit calculated in (b)(i).

Assessor's use only

(iii) Jake does not think the model $y = -x(x - 8)$ fits well after 4 months of the group's trading.

After 4 months of trading, he uses the model $(x - 4)^2 + y^2 = r^2$ for the remaining 6 months of the project.

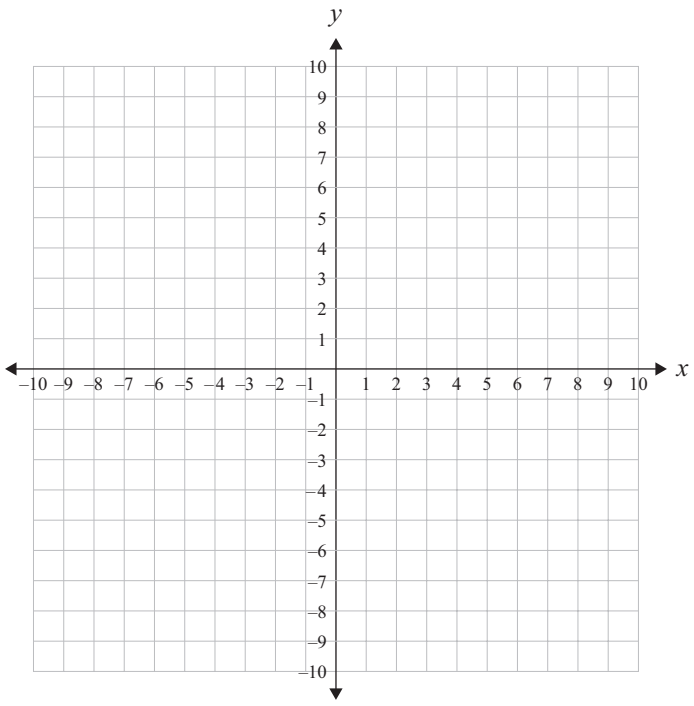
The YES project ends after 10 months.

For the 10 months that the group is trading, define the functions, giving any restrictions on the x and y values of the models.

QUESTION THREE

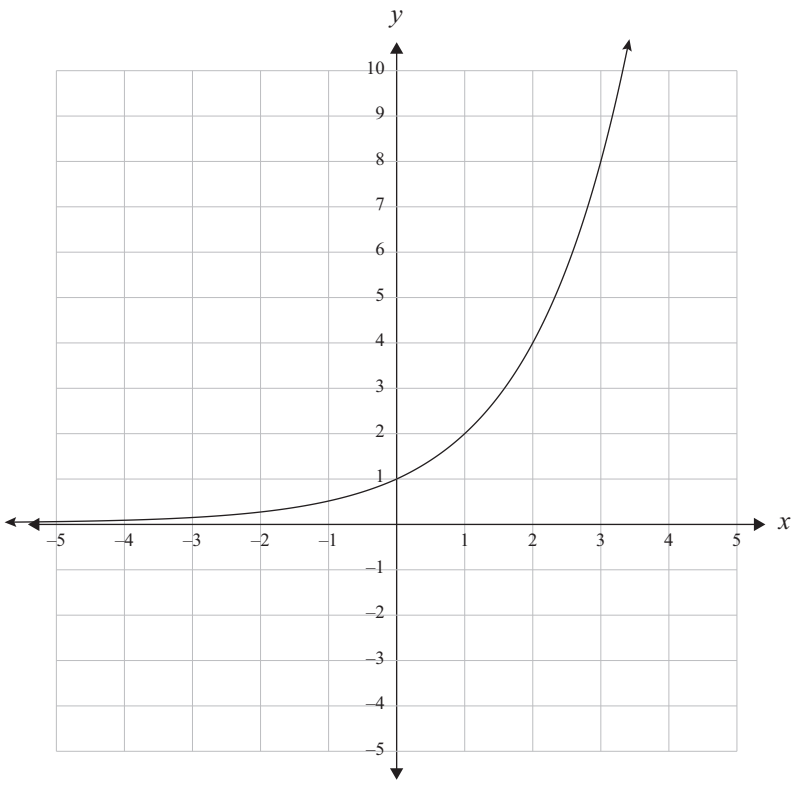
Assessor's use only

(a) Draw the graph of $y = (x - 1)(x + 1)(x + 3)$, clearly showing any key features.



If you need to redraw this graph, use the grid on page 9.

(b) (i) Give the equation of the graph below.



_____

_____ $y =$ _____

Assessor's use only

(ii) The graph in part (b)(i) can be used as a model to predict the number of bacteria at the end of each week in a contaminated pond, if their growth is not controlled.

y is the predicted number of bacteria, in thousands, in the contaminated pond, and x is the number of weeks since the number of bacteria were first recorded.

Find the increase in the number of bacteria from the end of the first week ($x = 1$) to the end of the fourth week if their growth is not controlled.

(iii) At the end of the first week, a scientist adds some chemical to the pond.

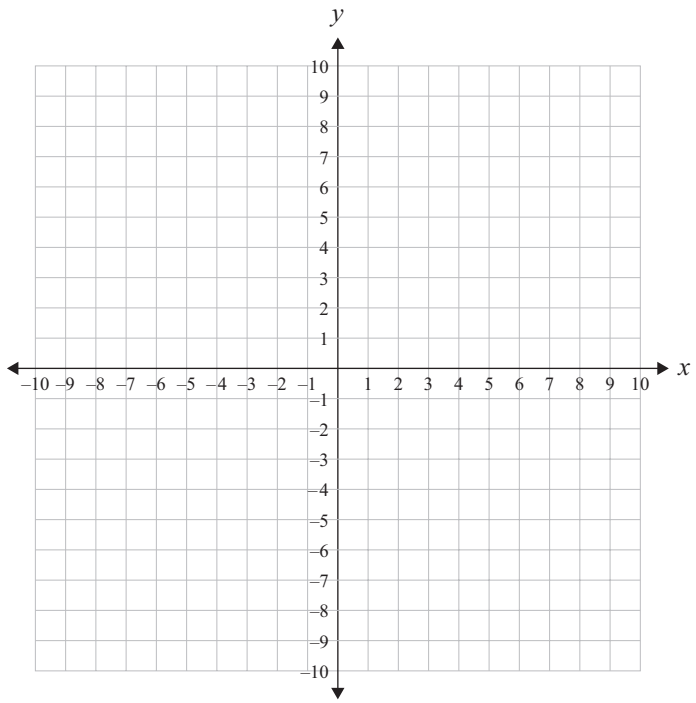
The chemical treatment reduces the **growth rate** of the bacteria by 80% each week for 5 weeks.

How many bacteria would be expected to be in the pond at the end of 5 weeks of treatment (6 weeks after the first count)?

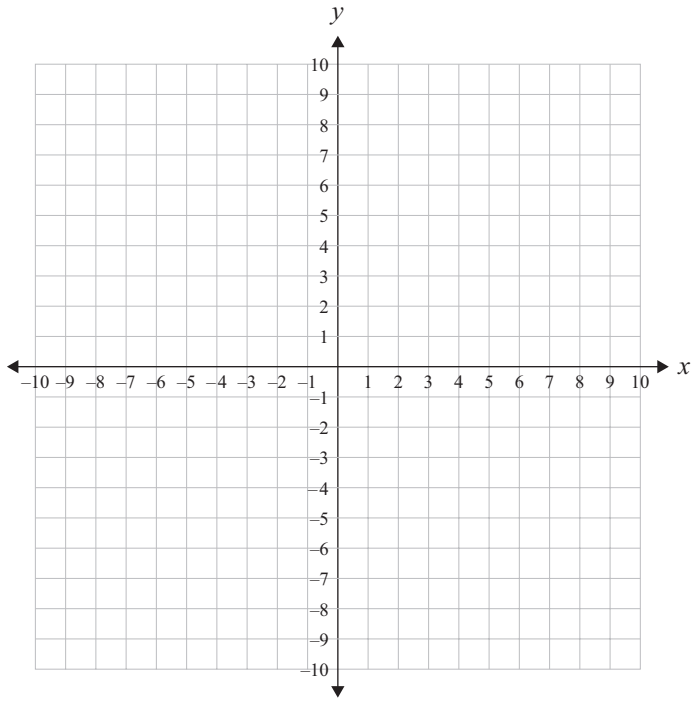
If you need to redraw a graph from page 2, draw it on a grid below and carefully number the question. Make sure it is clear which graph you want marked.

Assessor's use only

Question _____



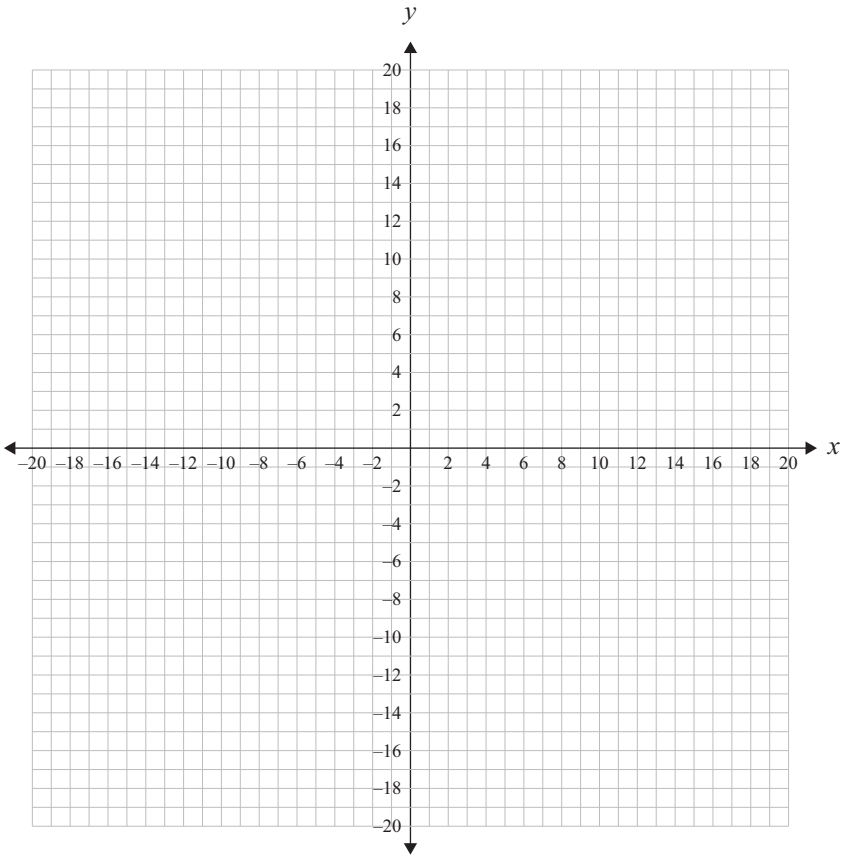
Question _____



Assessor's use only

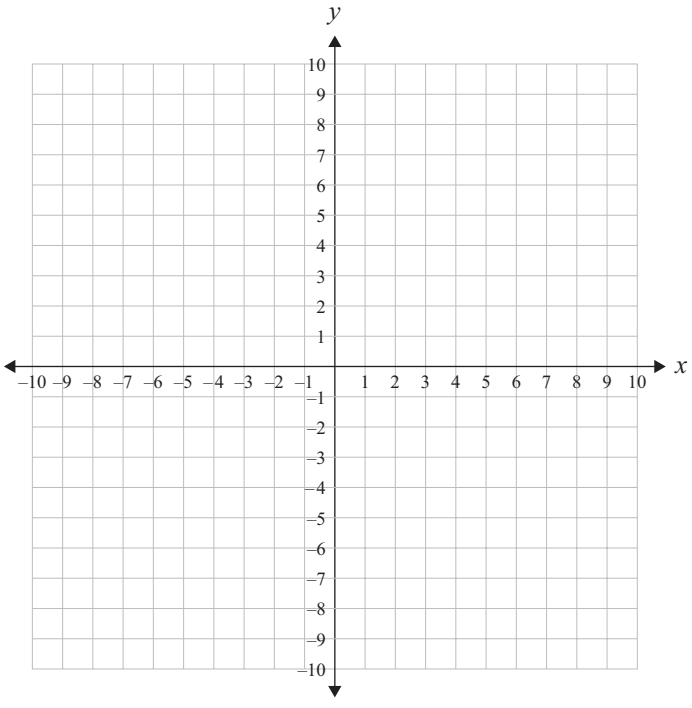
If you need to redraw the graph from page 4, draw it on the grid below and carefully number the question. Make sure it is clear which graph you want marked.

Question _____



If you need to redraw the graph from page 6, draw it on the grid below and carefully number the question. Make sure it is clear which graph you want marked.

Question _____



Extra paper for continuation of answers if required.
Clearly number the question.

Assessor's use only

Question number