



For Supervisor's use only

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90285



NEW ZEALAND QUALIFICATIONS AUTHORITY  
MANA TOHU MĀTAURANGA O AOTEAROA



National Certificate of Educational Achievement  
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

## Level 2 Mathematics, 2004

### 90285 Sketch and interpret non-linear graphs

Credits: Three

2.00 pm Tuesday 23 November 2004

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 a copy of Formulae Sheet L2-MATHF.

You should answer ALL the questions in this booklet.

Show ALL working.

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

Check that this booklet has pages 2–16 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.**

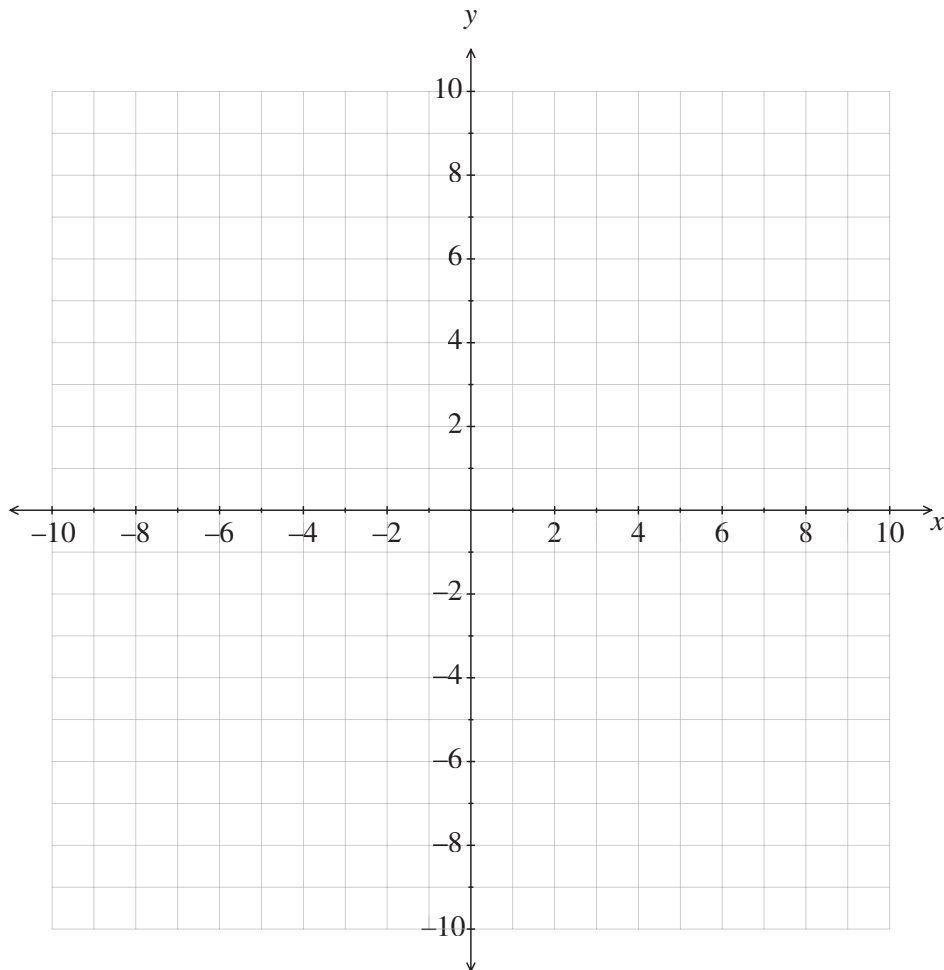
Achievement Criteria			For Assessor's use only		
Achievement		Achievement with Merit		Achievement with Excellence	
Sketch non-linear graphs from equations and identify relevant features of graphs.	<input type="checkbox"/>	Plot graphs of equations and interpret their features.	<input type="checkbox"/>	Determine and apply an appropriate graphical model for a situation.	<input type="checkbox"/>
		Write equations of graphs.	<input type="checkbox"/>		
Overall Level of Performance (all criteria within a column are met)					<input type="checkbox"/>

You are advised to spend 35 minutes answering the questions in this booklet.

Show working.

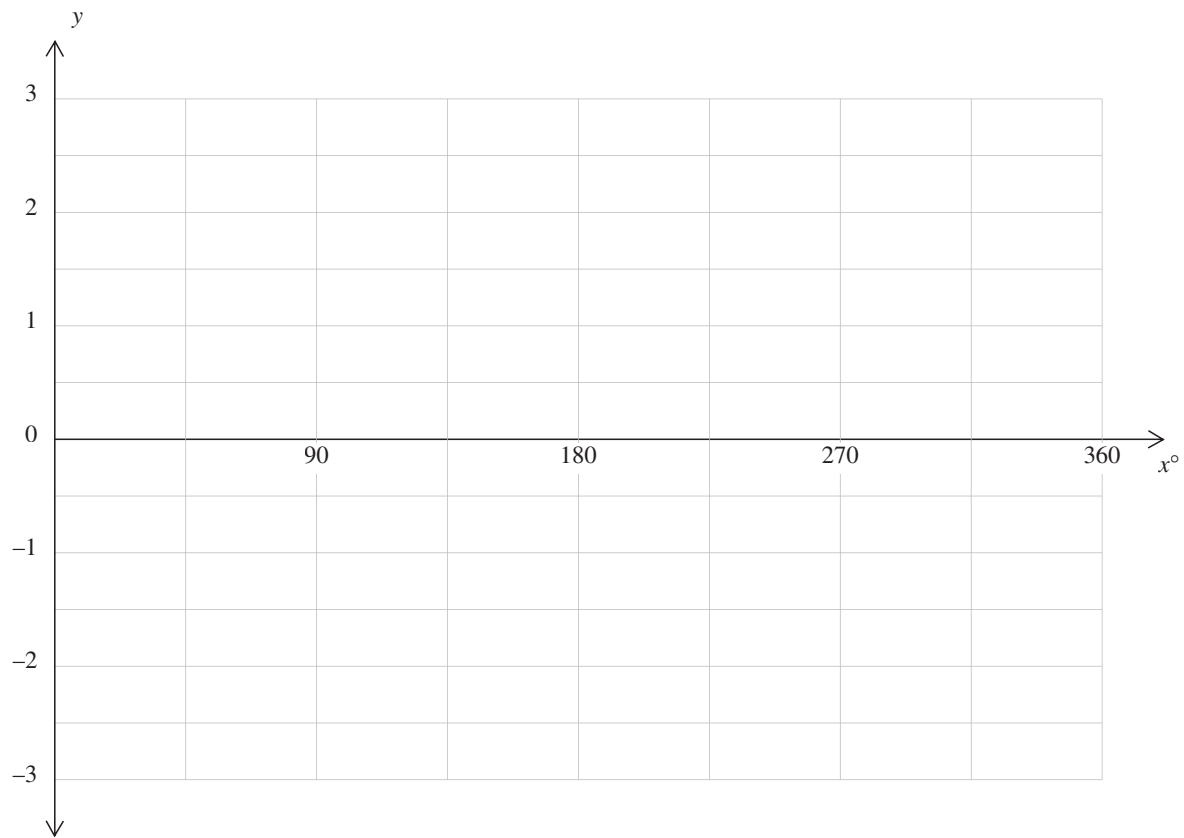
### QUESTION ONE

- (a) Sketch the graph of  $y = x(x - 3)(x + 2)$



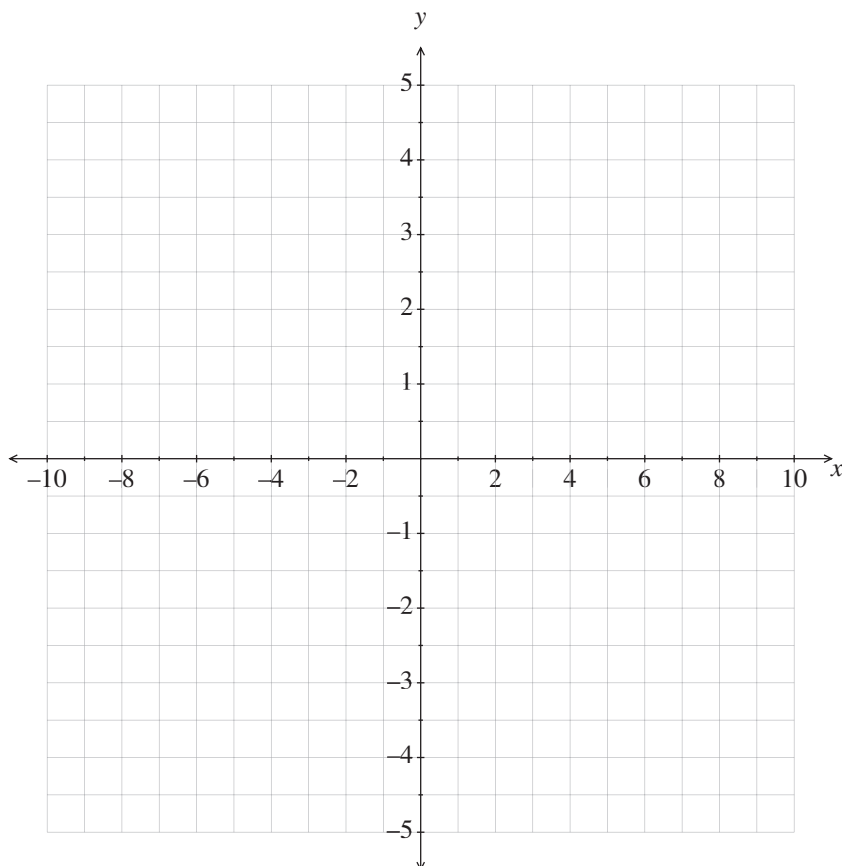
*If you need to  
redraw this graph,  
use page 12.*

- (b) Sketch the graph of  $y = \sin x + 2$  for  $0 \leq x \leq 360$

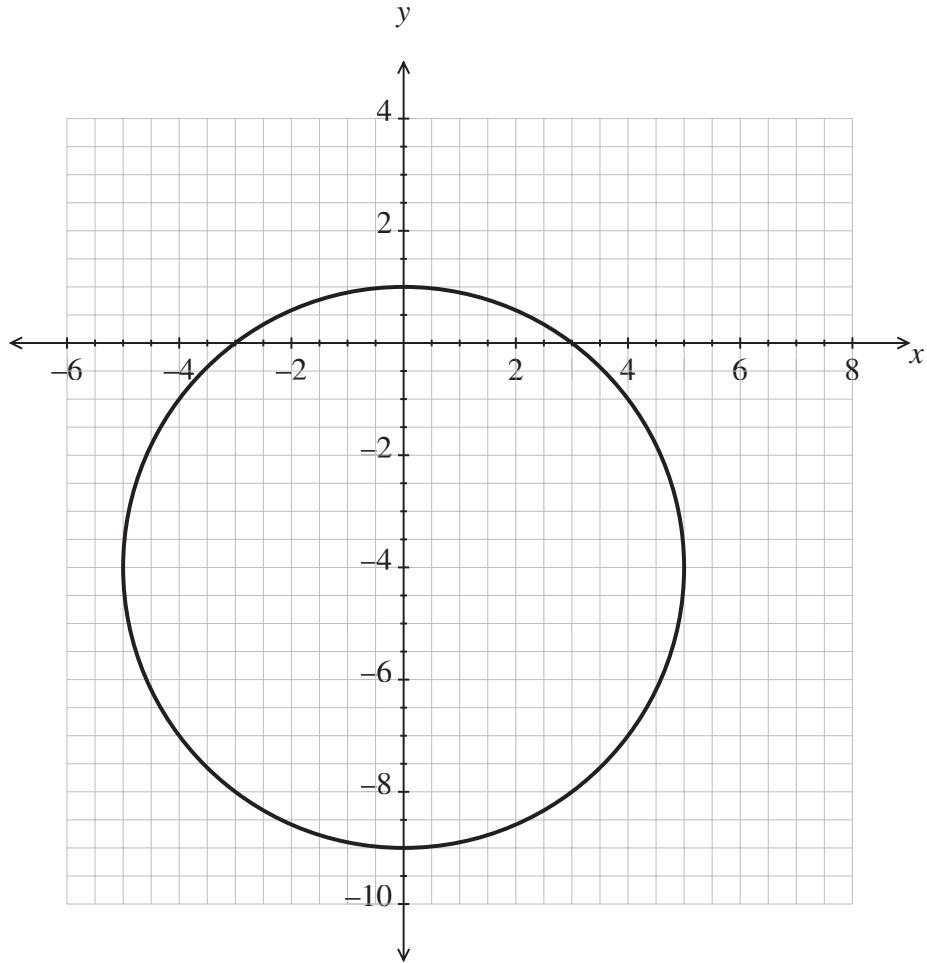


- (c) Sketch the graph of  $y = \log_{10} x$

*If you need to redraw  
either of these graphs,  
use page 12 or  
page 13.*



(d) Describe THREE features of the graph below.

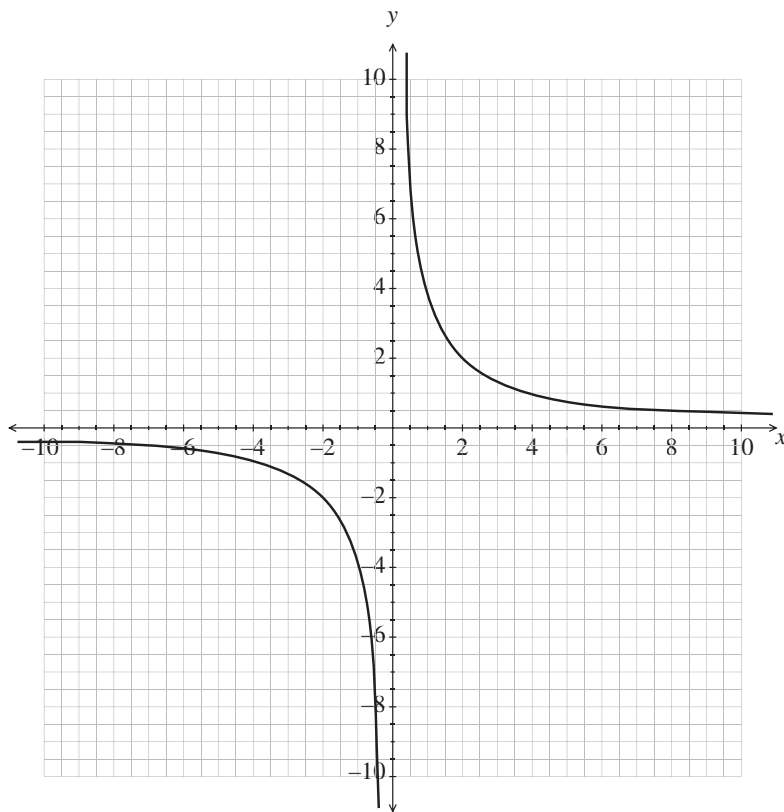


- (1) \_\_\_\_\_  
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- (2) \_\_\_\_\_  
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- (3) \_\_\_\_\_  
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**QUESTION TWO**Assessor's  
use only

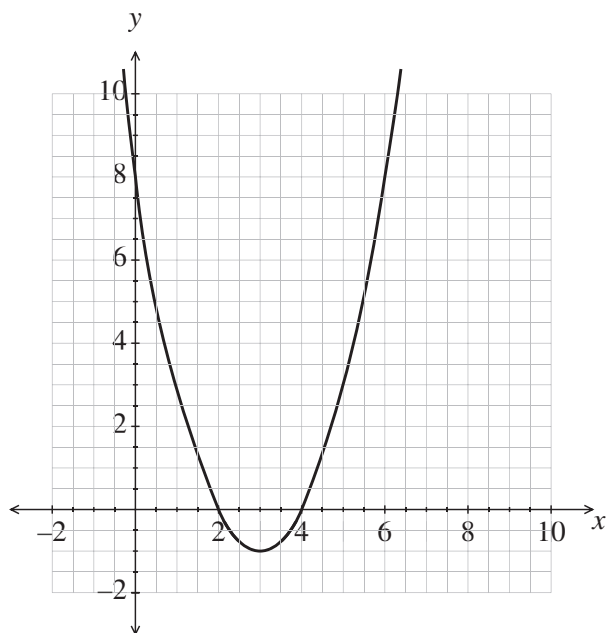
Write down the equation of EACH of the following graphs.

(a)



Equation:

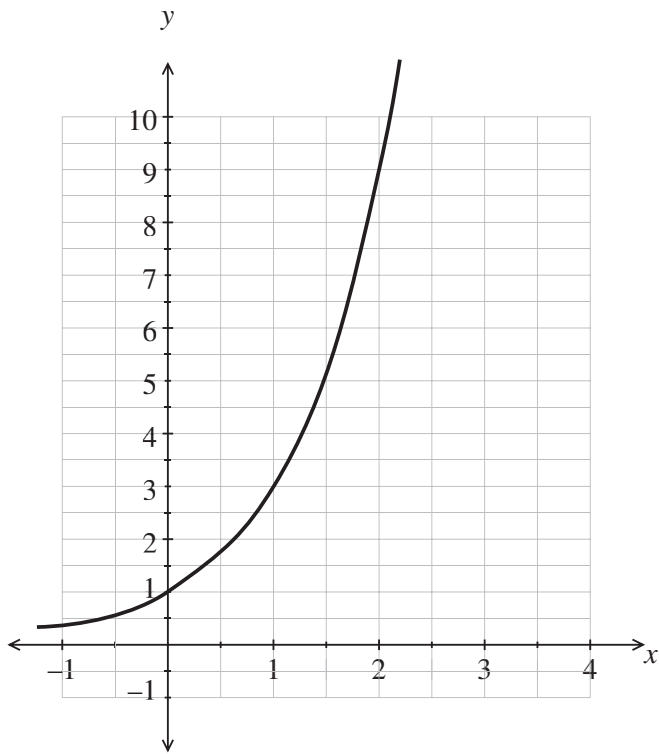
(b)



Equation:

Write down the equation of the following graph.

(c)

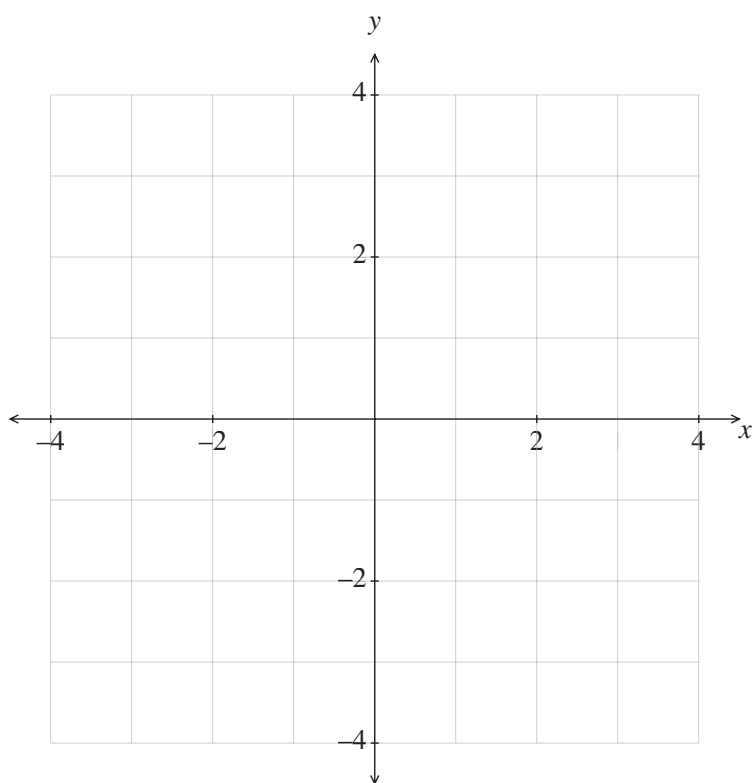


Equation:

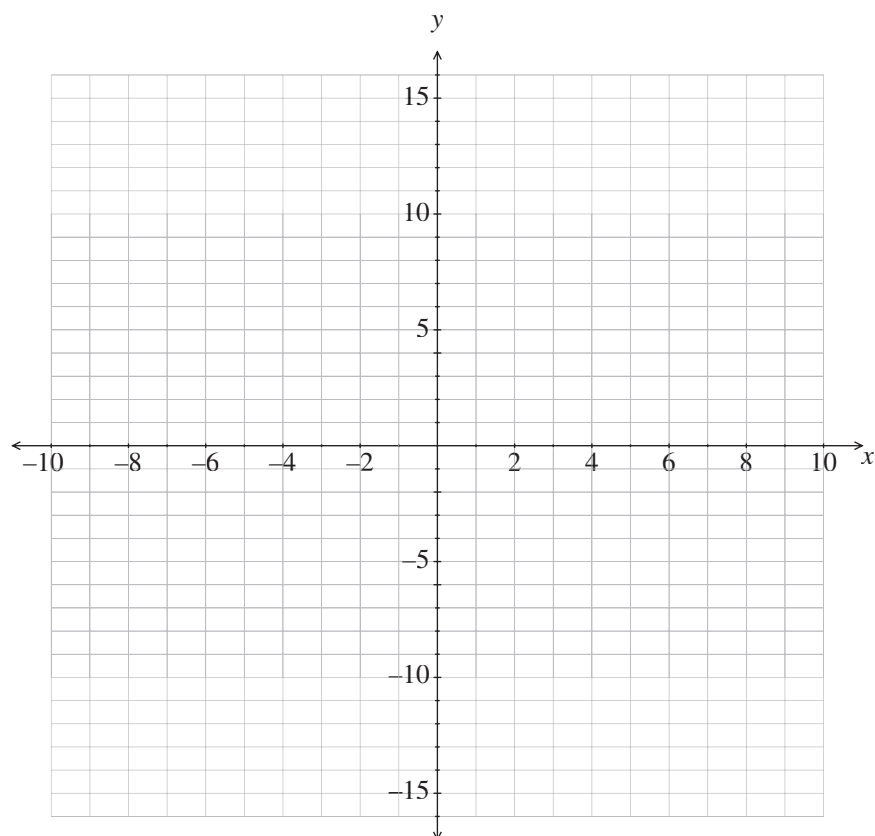
**QUESTION THREE**Assessor's  
use only

Draw the graphs of EACH of the following equations

(a)  $y = 2x^2 - x - 3$



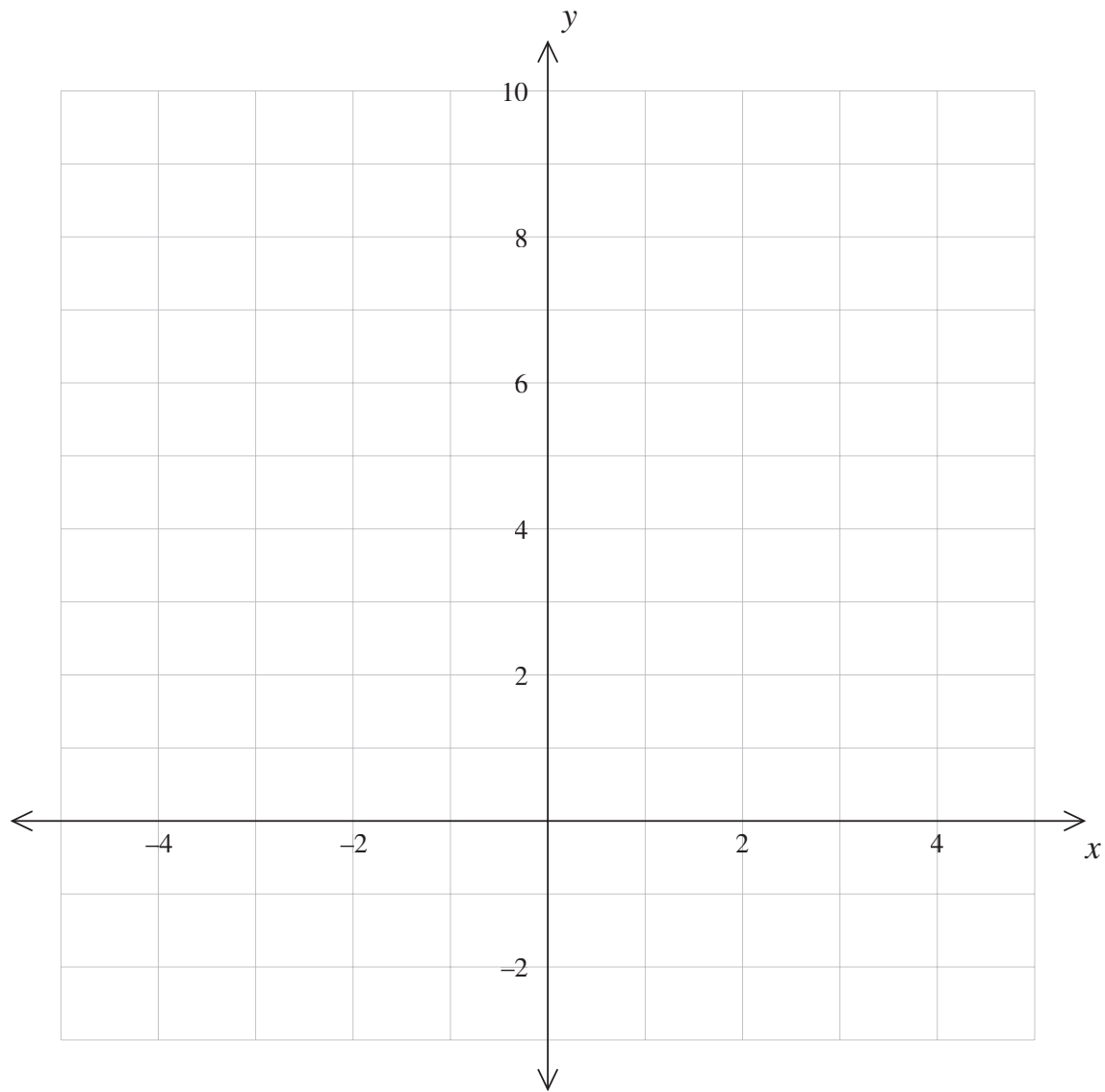
(b)  $y = -x^3 + 8$



*If you need to redraw  
either of these graphs,  
use page 13 or  
page 14.*

Draw the graph of the following equation

(c)  $y = 3(2^x)$



*If you need to  
redraw this graph,  
use page 15.*



## QUESTION FOUR

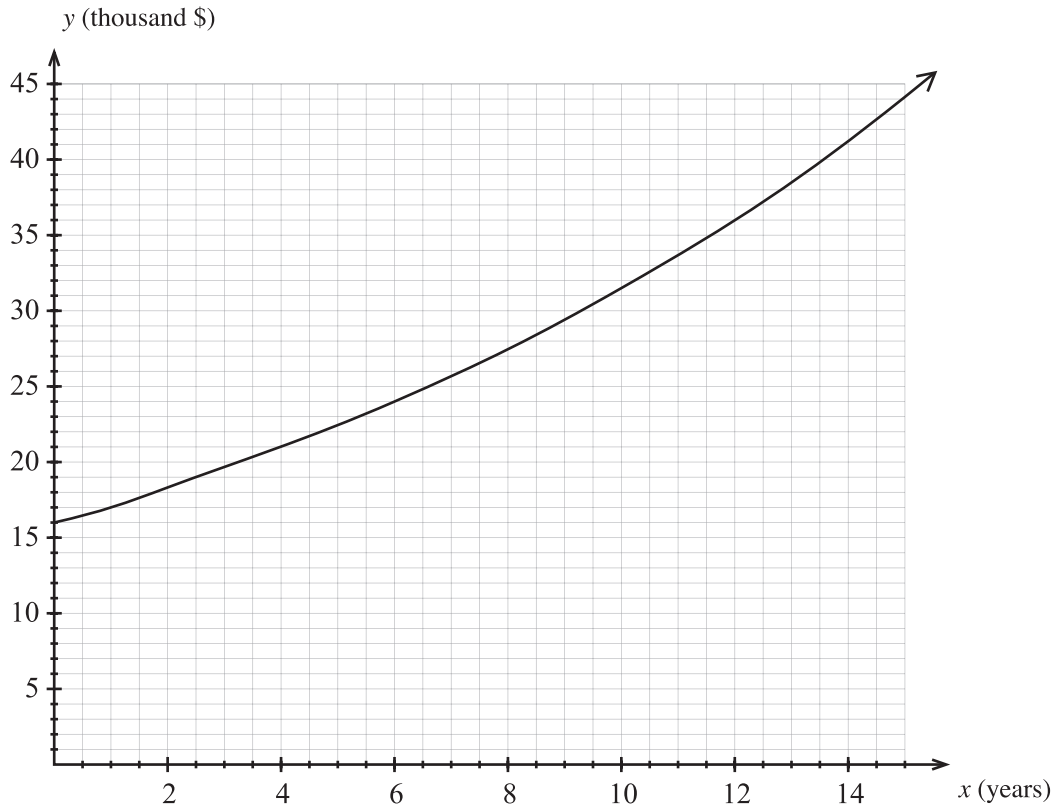
Assessor's  
use only

Bruce invests some money in an account with an investment company.

The investment company sends him a graph of the amount of money he can expect over a period of 15 years.

The equation of the graph is  $y = 16 \times 1.07^x$

where  $y$  is the amount of money in **thousands** of dollars and  $x$  is the number of years since the money was invested.



- (a) How much was Bruce's initial investment?

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- (b) The interest is paid at the end of each year.

At the end of which year would you expect Bruce to have doubled the amount of money he had invested?

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- (c) If he takes \$2 000 from the account at the end of 5 years, how would this affect the graph?

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### QUESTION FIVE

Assessor's  
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Following a hurricane on Graph Island the government opened an appeal for the restoration of a village.

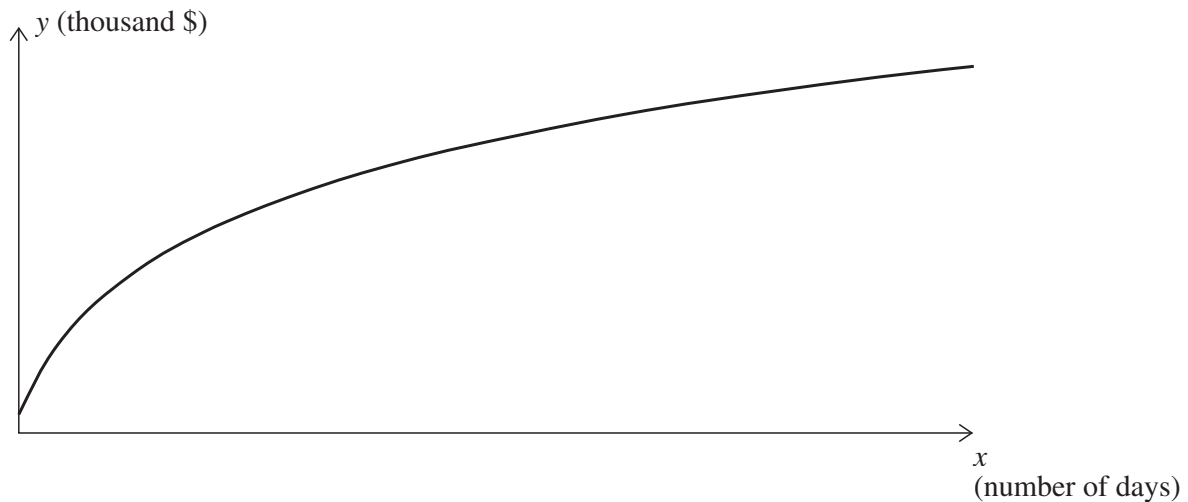
The government opened the appeal by making an initial deposit.

The amount of money in the restoration fund can be represented by

$$F = A \log_{10}(x+2) + B$$

where  $F$  is in **thousands** of dollars

and  $x$  is the number of days since the fund opened.



By the end of the first day there was \$8 000 in the fund.

The amount of money in the fund at the end of the fourth day was \$18 000.

- (a) Give the equation of the model. (Round  $A$  and  $B$  to 2 decimal places.)

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- (b) If the current rate of giving continued and no money was taken from the fund, use your model to estimate the amount in the fund by the end of THREE weeks (21 days).

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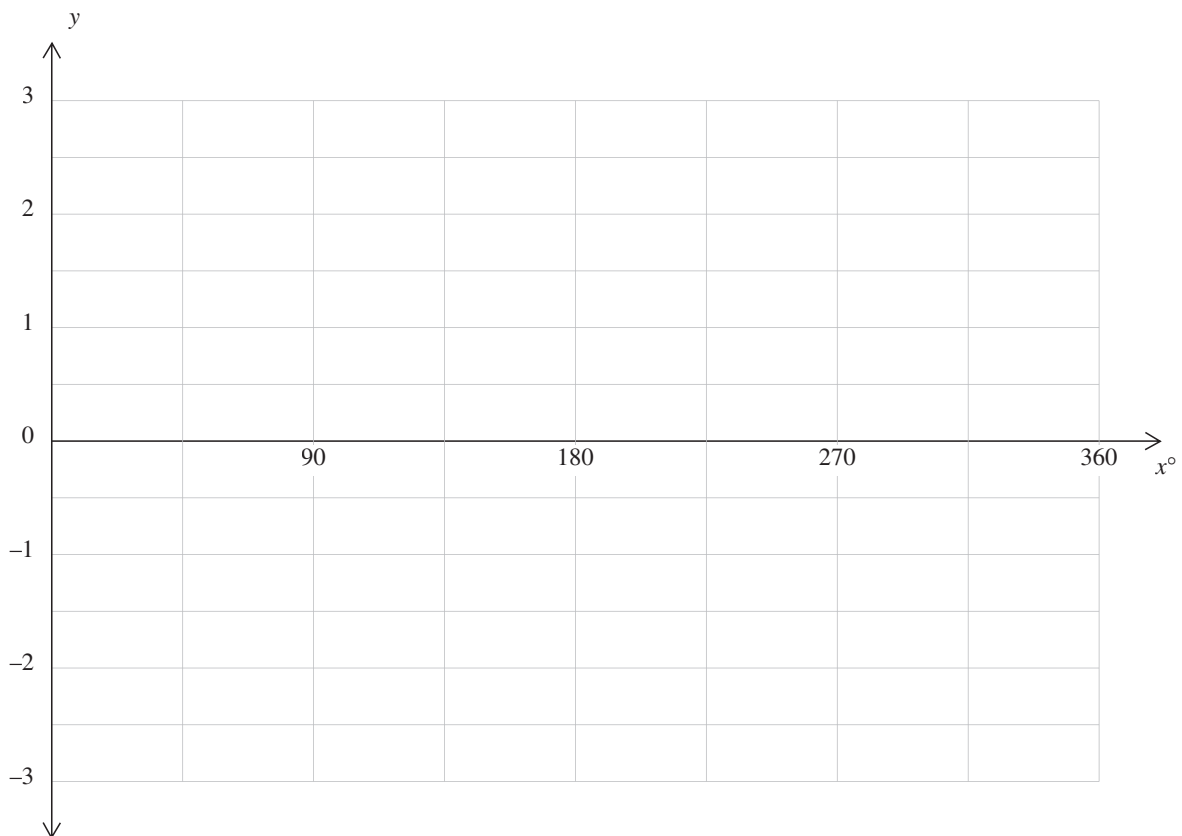
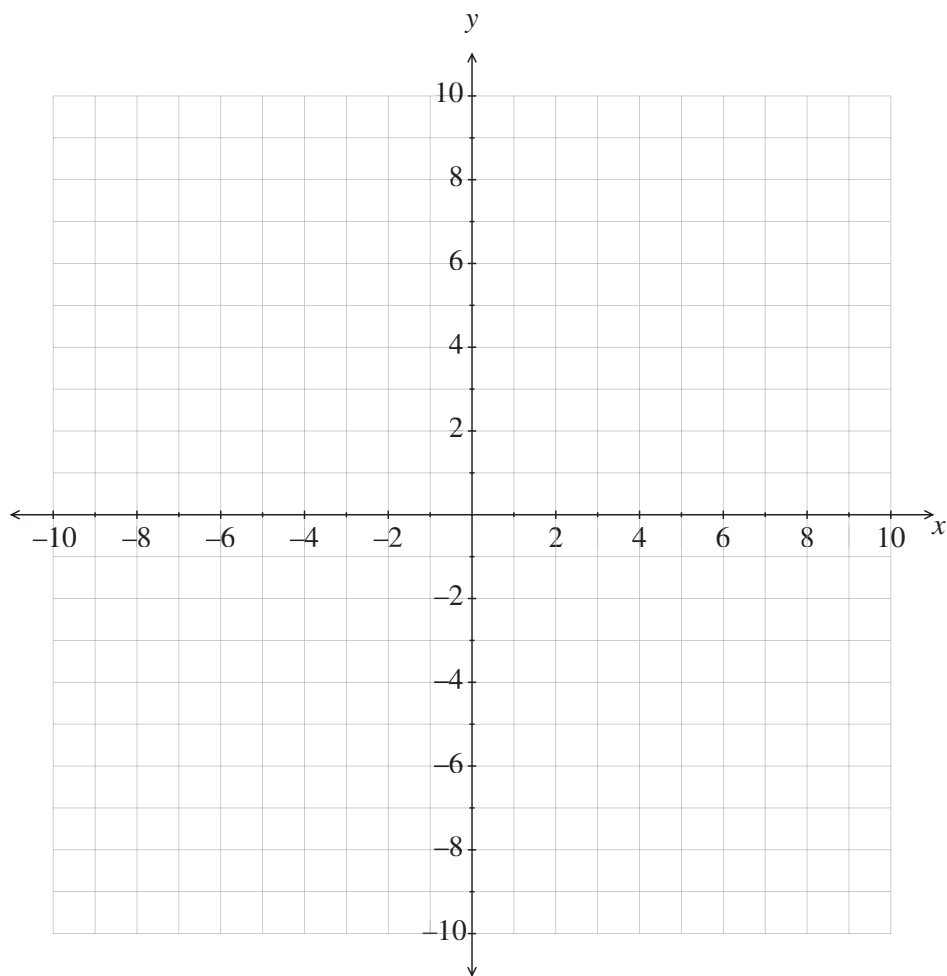
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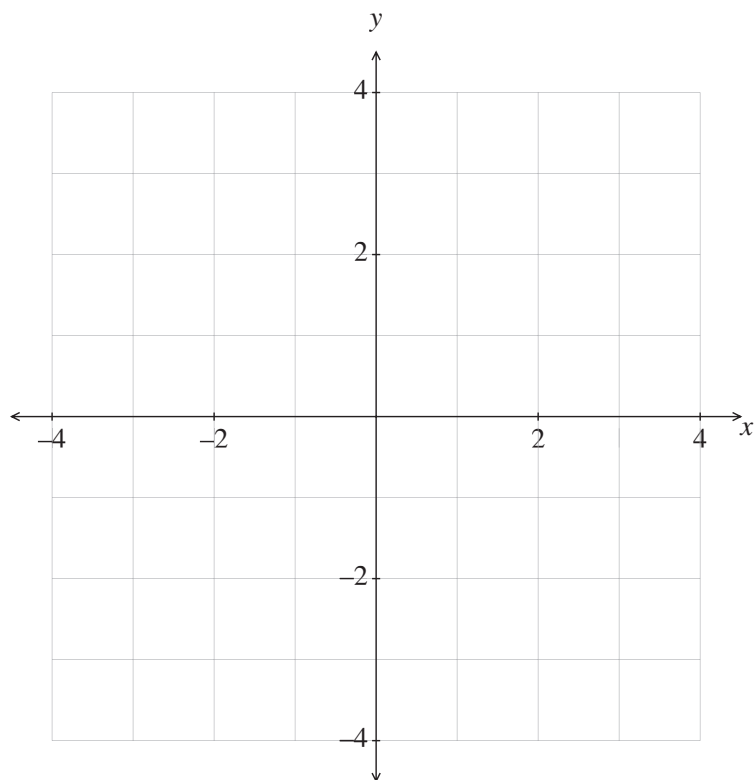
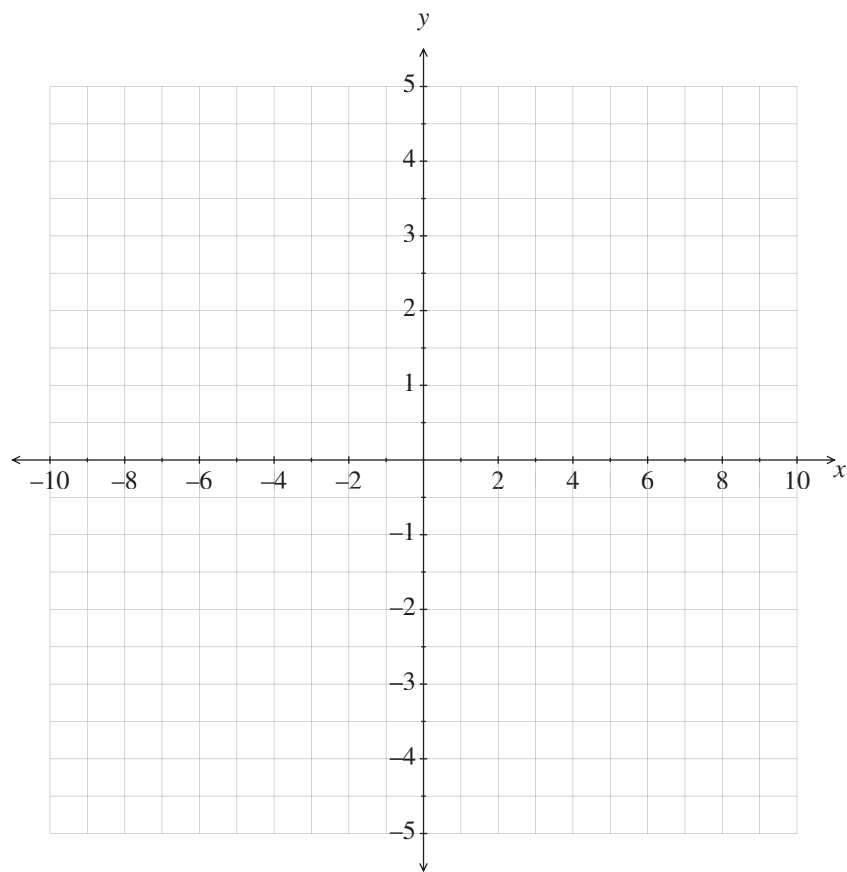
If you have made a mistake and need to redraw a graph, use the appropriate copy printed here.

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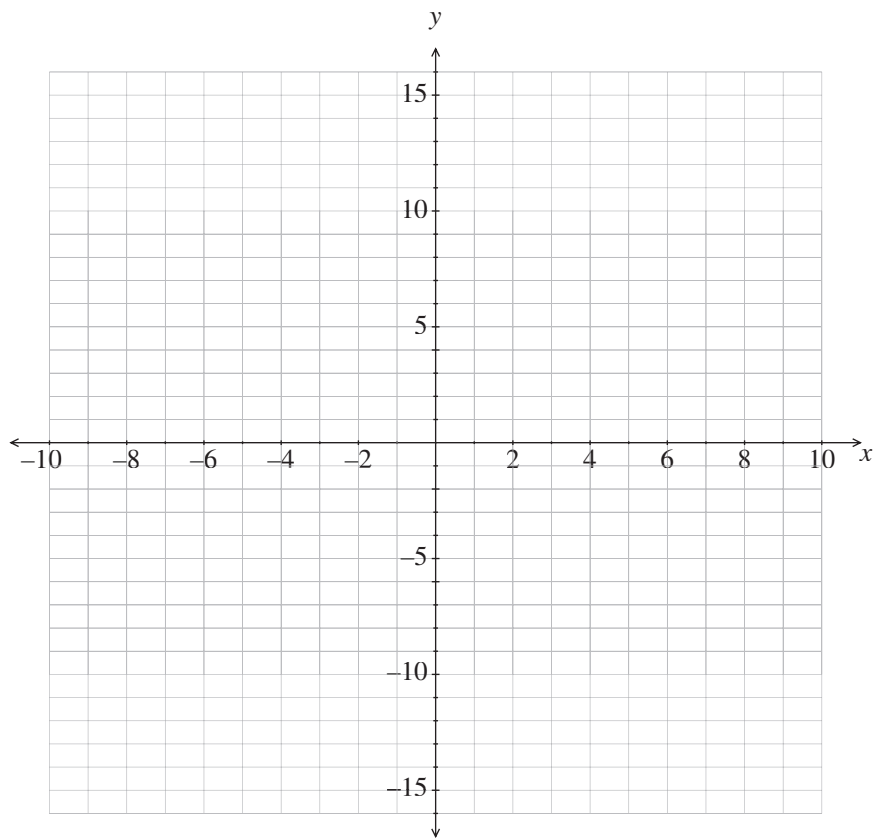
*If you have made a mistake and need to redraw a graph, use the appropriate copy printed here.*

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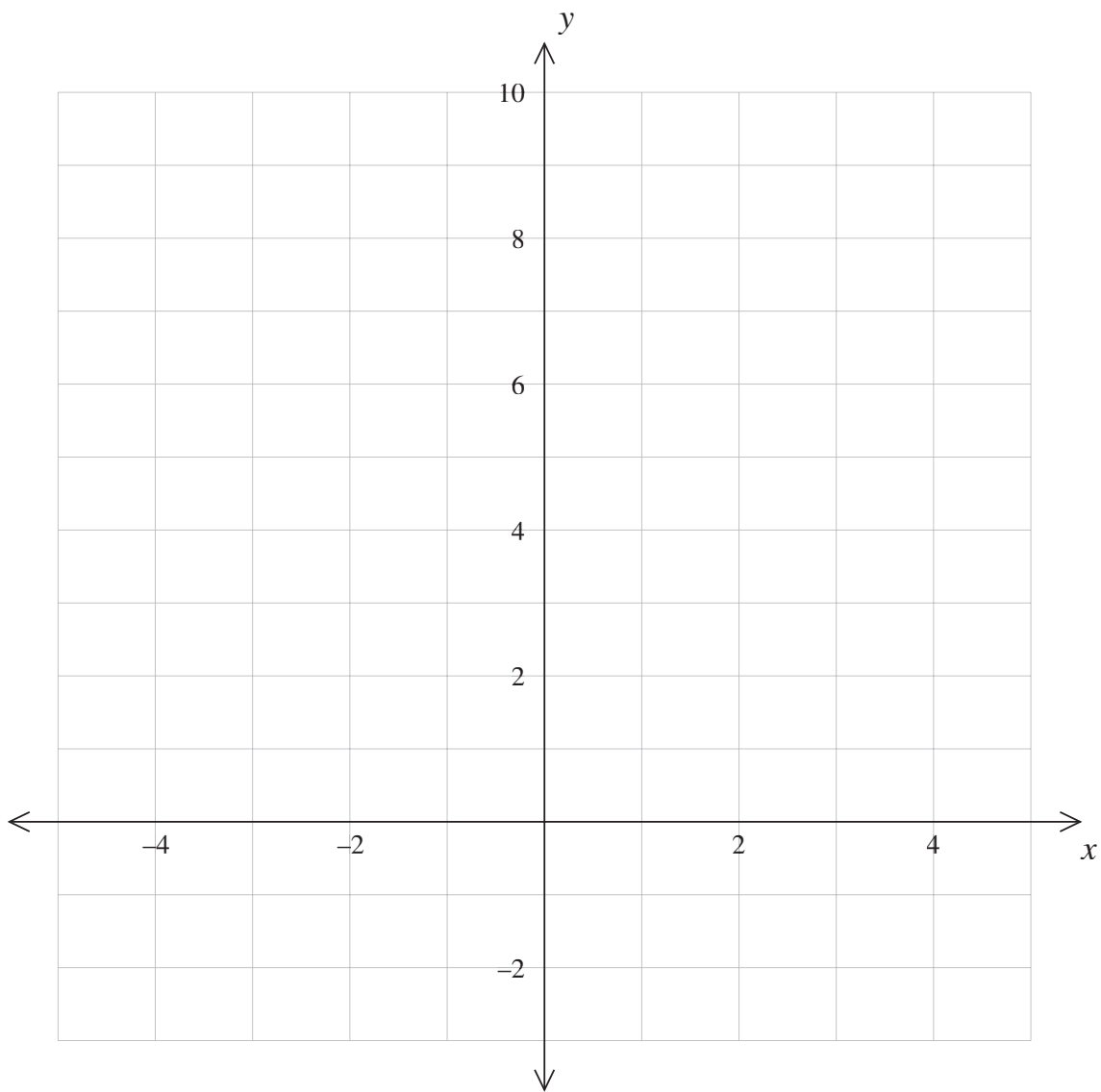
*If you have made a mistake and need to redraw a graph, use the appropriate copy printed here.*

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*If you have made a mistake and need to redraw a graph, use the appropriate copy printed here.*

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