3

90639

906390

NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

*For Supervisor's use only*

# Level 3 Calculus, 2008

## 90639 Sketch graphs of conic sections and write equations related to conic sections

Credits: Three
9.30 am Tuesday 18 November 2008

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 the Formulae and Tables Booklet L3–CALCF.**

You should answer ALL the questions in this booklet.

Show ALL working for ALL questions.

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 2–16 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.**

| *For Assessor's use only* | Achievement Criteria | | | | |
|---|---|---|---|---|---|
| **Achievement** | | **Achievement with Merit** | | **Achievement with Excellence** | |
| Sketch graphs of conic sections and write equations related to conic sections. | | Solve problems involving conic sections. | | Solve more complex conic section problems. | |
| **Overall Level of Performance** | | | | | |

You are advised to spend 40 minutes answering the questions in this booklet.

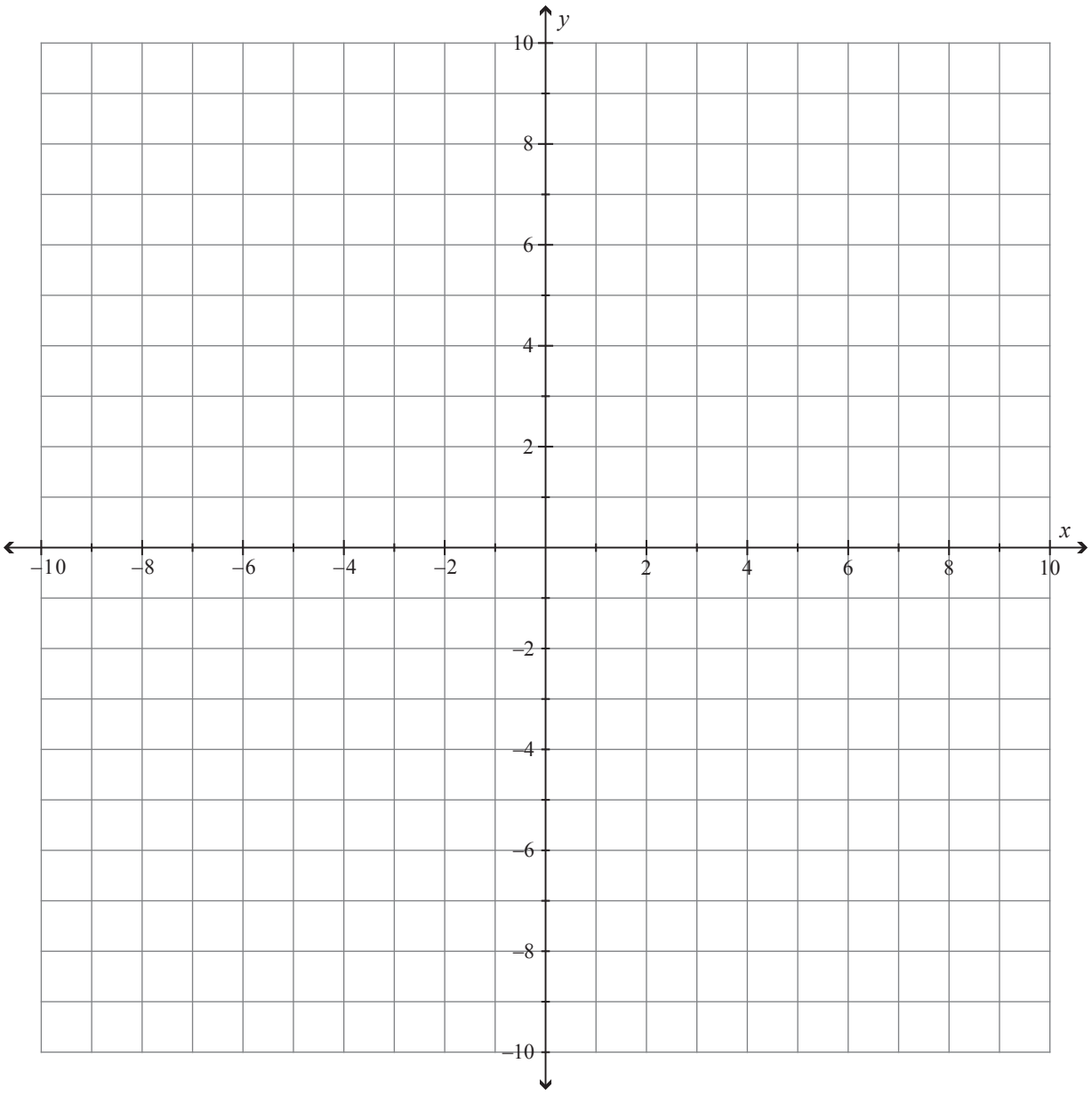
Assessor's use only

## QUESTION ONE

*If you need to redraw this graph, use the grid on page 5, 14 or 15.*

Sketch the graph of $4x^2 + y^2 = 64$.

Label any intercepts and any asymptotes.



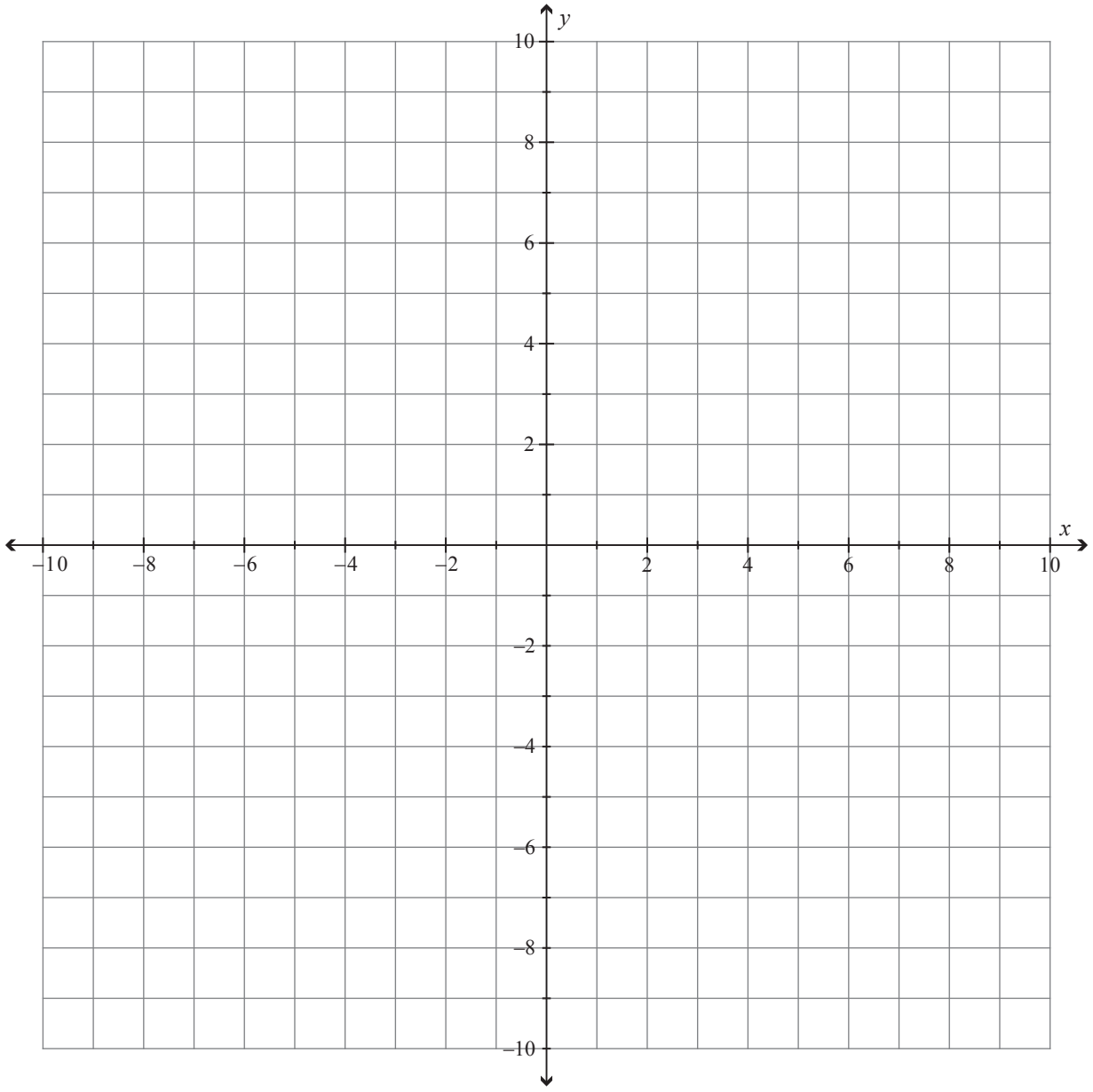
## QUESTION TWO

Sketch the graph of the curve defined by $x = 4\cos\theta$
and $y = 4\sin\theta + 4$

Label any intercepts and any asymptotes.

*If you need to redraw this graph, use the grid on page 5, 14 or 15.*

Assessor's use only



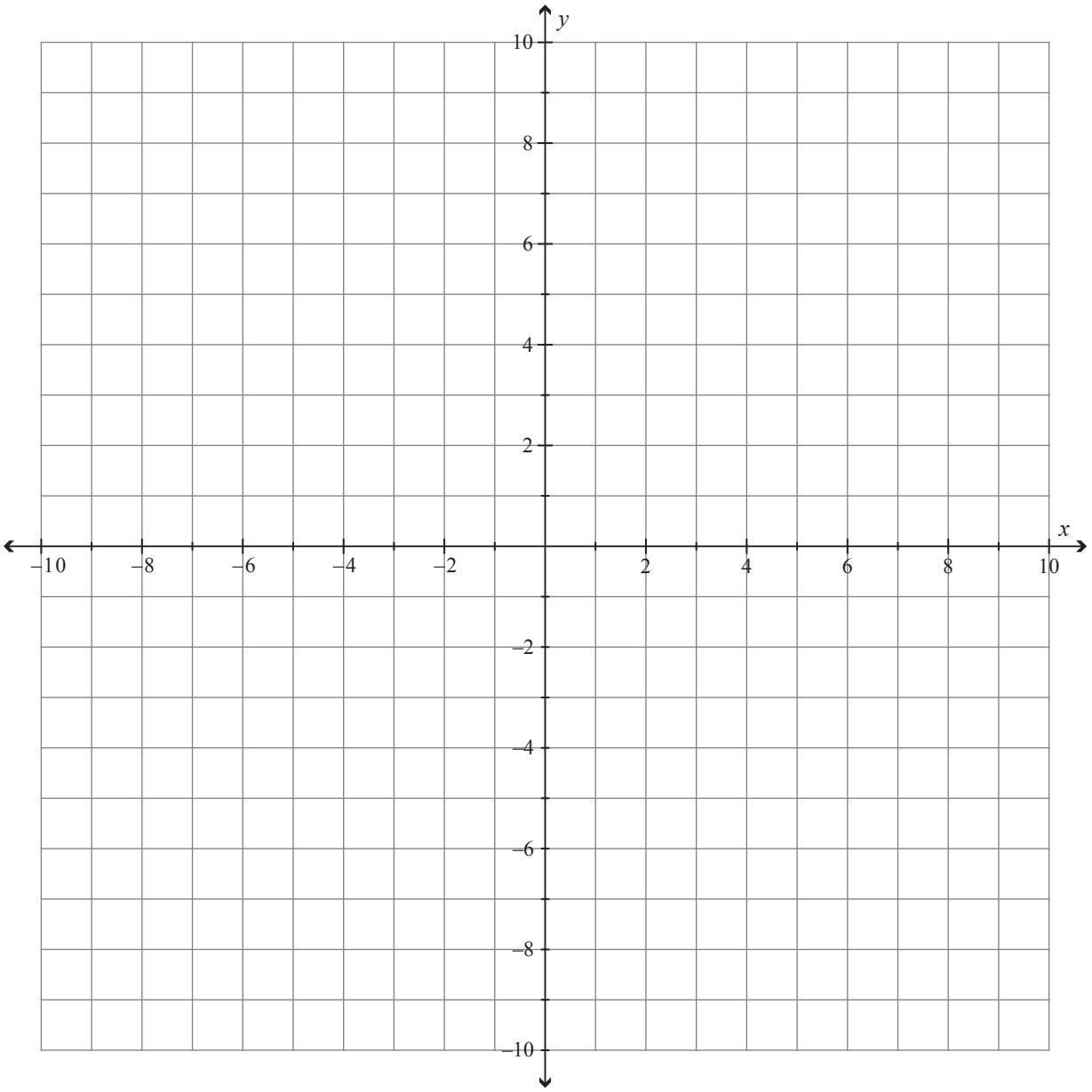
## QUESTION THREE

Sketch the graph of the curve defined by $x = 2\sec t$
and $y = 6\tan t$

Label any intercepts and any asymptotes.

*If you need to redraw this graph, use the grid on page 5, 14 or 15.*

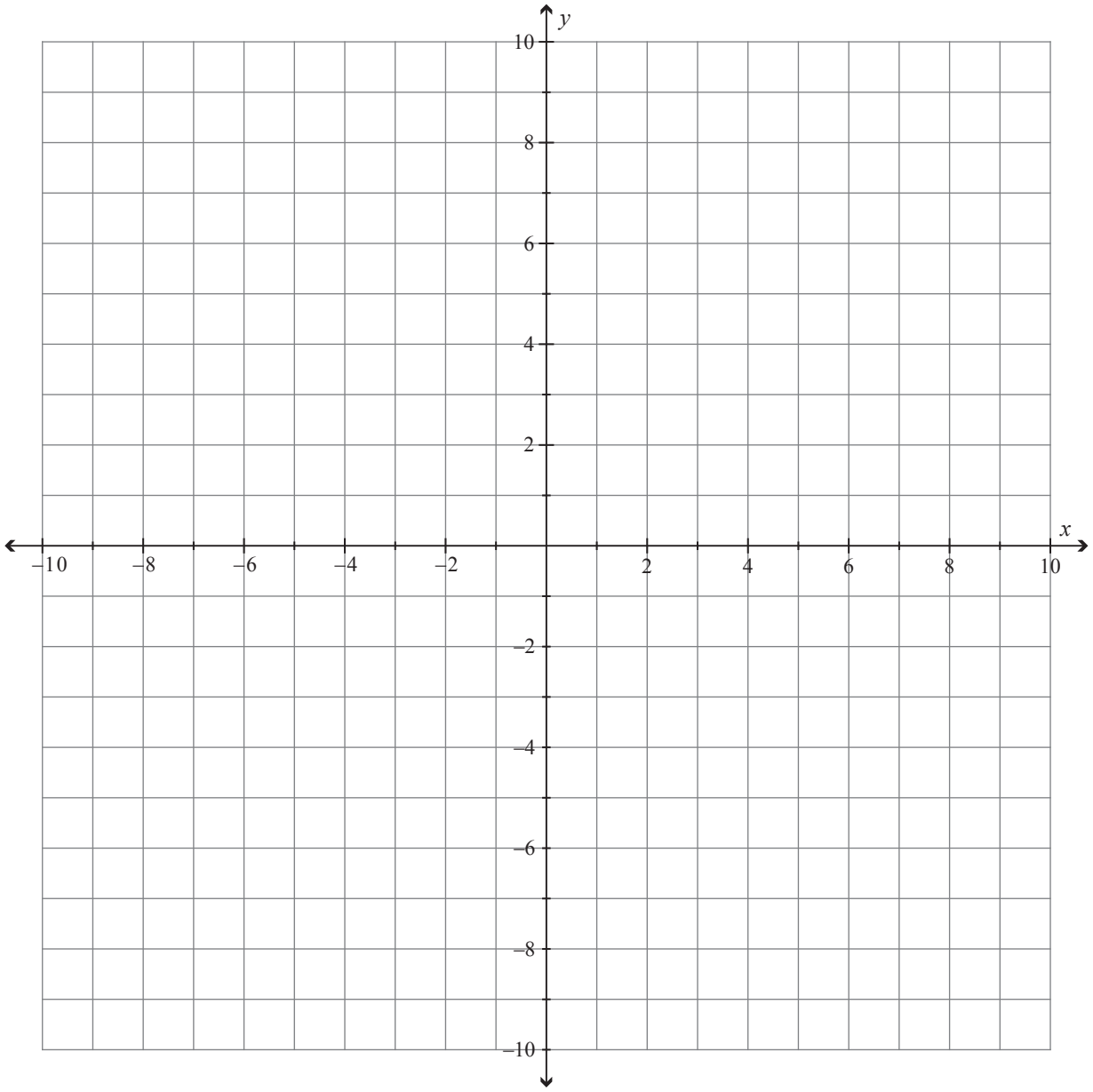
Assessor's use only



If you have made a mistake and need to redraw a graph, use the grid printed here and clearly number the question.

Assessor's use only

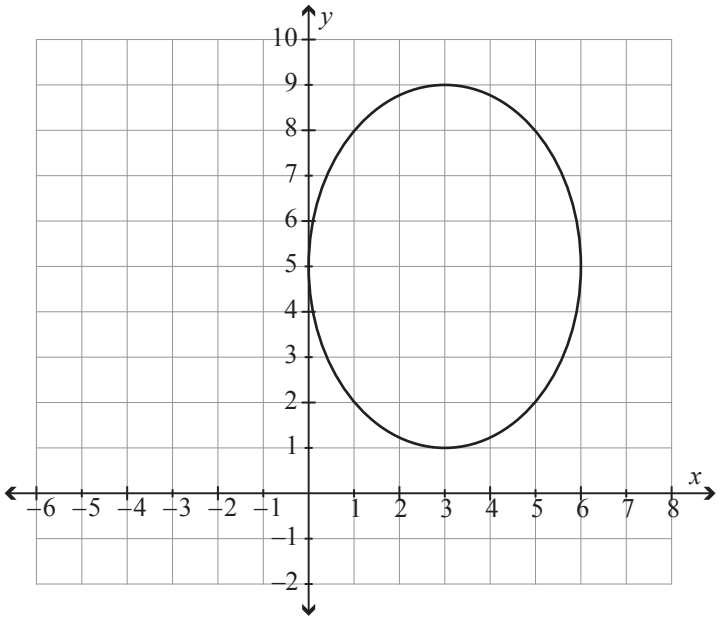
You must cross out the graph that you do not want marked.



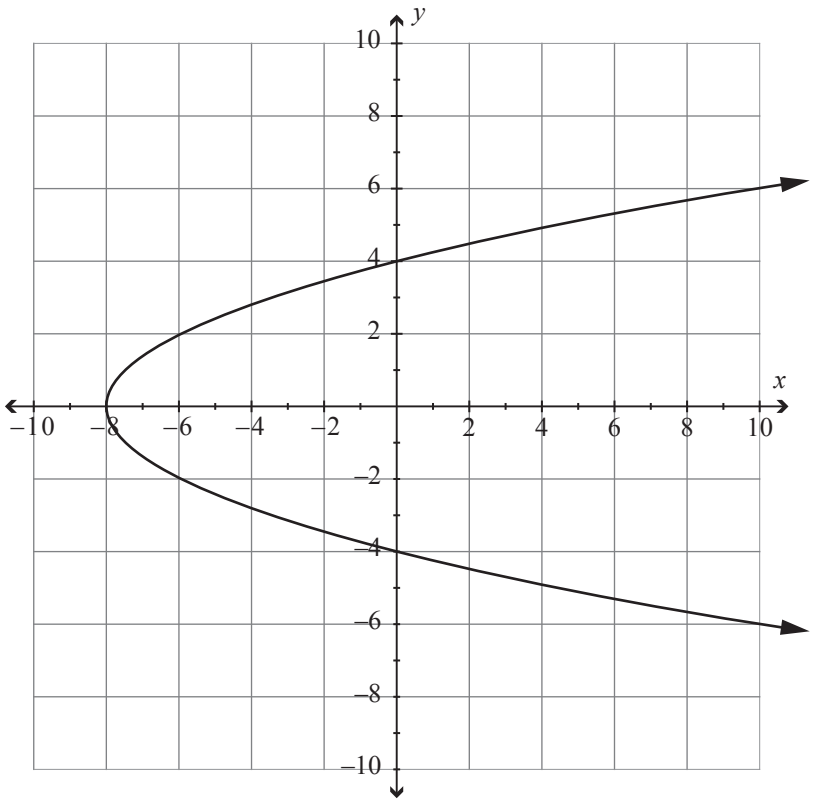
## QUESTION FOUR

Assessor's use only

(a) Write the equation of the conic section shown.




(b) Write the equation of the conic section shown.



## QUESTION FIVE

Assessor's use only

Find the equation of the tangent to the ellipse $\frac{x^2}{100}+\frac{y^2}{25}=1$ at point $(-6,4)$.

## QUESTION SIX

Assessor's use only

A 'slips cradle' is a device that cricketers use for fielding practice.
The shape of a slips cradle can be modelled by one half of a hyperbola.
The full hyperbola has the line AD as a line of symmetry.
The cradle is supported by a long straight board AD at the back.

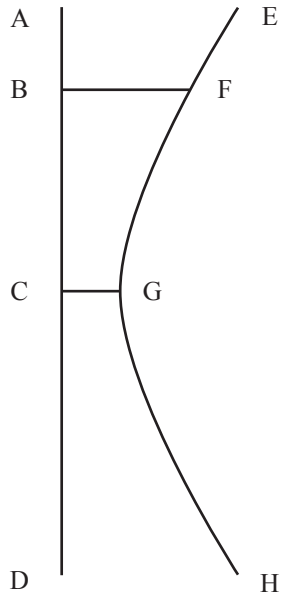



*Diagram is NOT to scale.*

The closest the cradle is to the board is at point G, the centre of the cradle.
The distance from C to G is 5 cm.
The distance from A to D is 160 cm, as is the distance from E to H.
The ends of the cradle are points E and H, and they are $\sqrt{425}$ cm from points A and D respectively.
There is a support point at F in the cradle, which meets the board AD at 90° at point B.

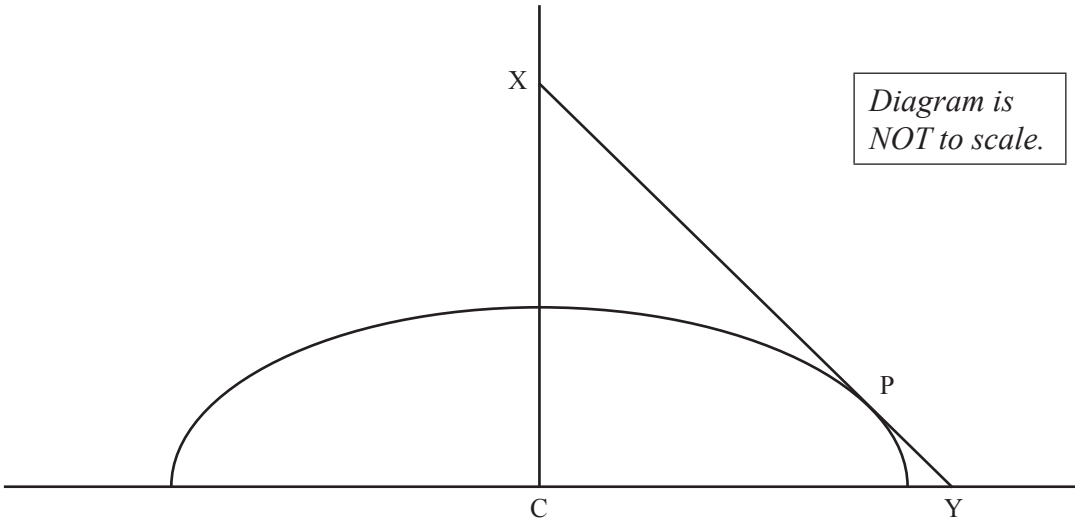
If point B is 60 cm from point C, how long is support BF?

Assessor's use only

## QUESTION SEVEN

Assessor's use only

The 'big top' tent can be modelled by the upper half of an ellipse, as shown in the diagram below.




The tent is 40 m across at the base, and its highest point is 10 m above the ground.
There is a long pole from the centre of the tent, point C, which passes through the top of the tent.
Near the top of the pole a long straight support wire is attached at point X.
This wire is tangent to the surface of the tent at point P, and continues until it reaches the ground at point Y.
Point X is 25 m above the point C.

How high above the ground is point P?

Assessor's use only

**Question Eight is on the following page.**

## QUESTION EIGHT

Assessor's use only

Find the equations of both lines that pass through the point (1,2) and are tangents to the curve

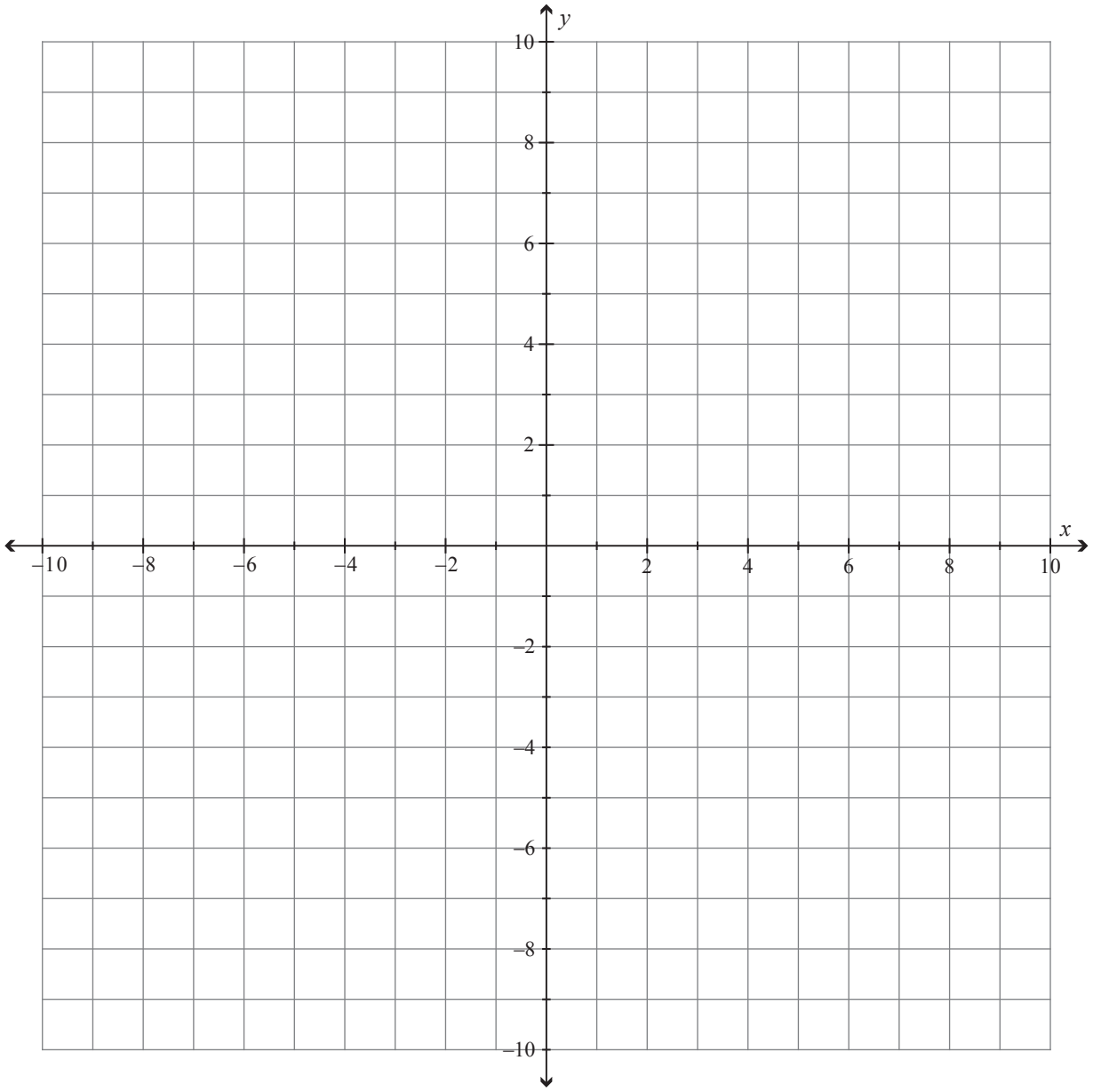
$$x^2 + y^2 + 6x + 5 = 0.$$

Assessor's use only

If you have made a mistake and need to redraw a graph, use the grid printed here and clearly number the question.

Assessor's use only

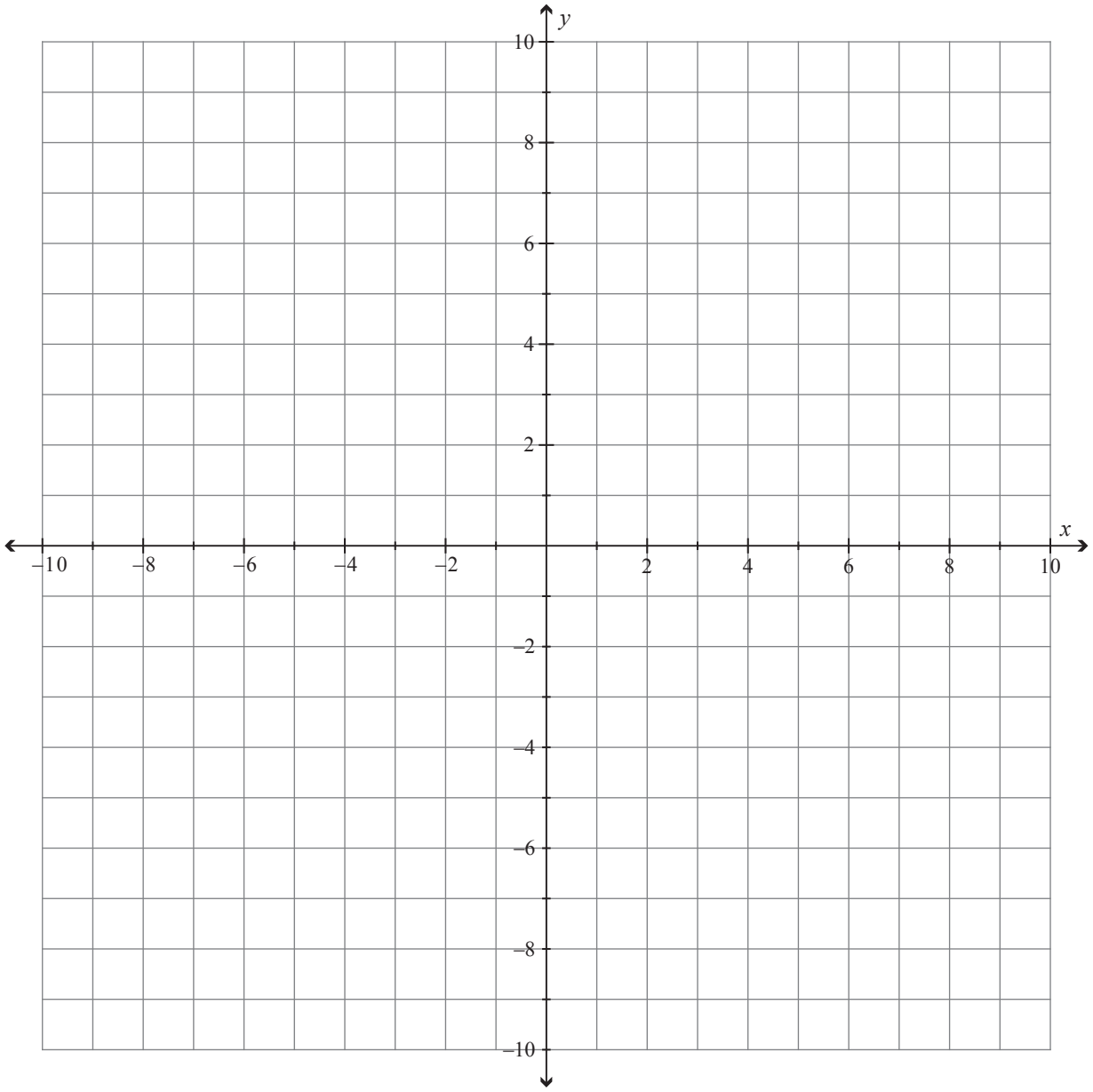
You must cross out the graph that you do not want marked.



If you have made a mistake and need to redraw a graph, use the grid printed here and clearly number the question.

Assessor's use only

You must cross out the graph that you do not want marked.



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

Assessor's use only

Question number