For Supervisor's use only

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90639

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

Level 3 Calculus, 2006

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

Credits: Three
9.30 am Wednesday 29 November 2006

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.

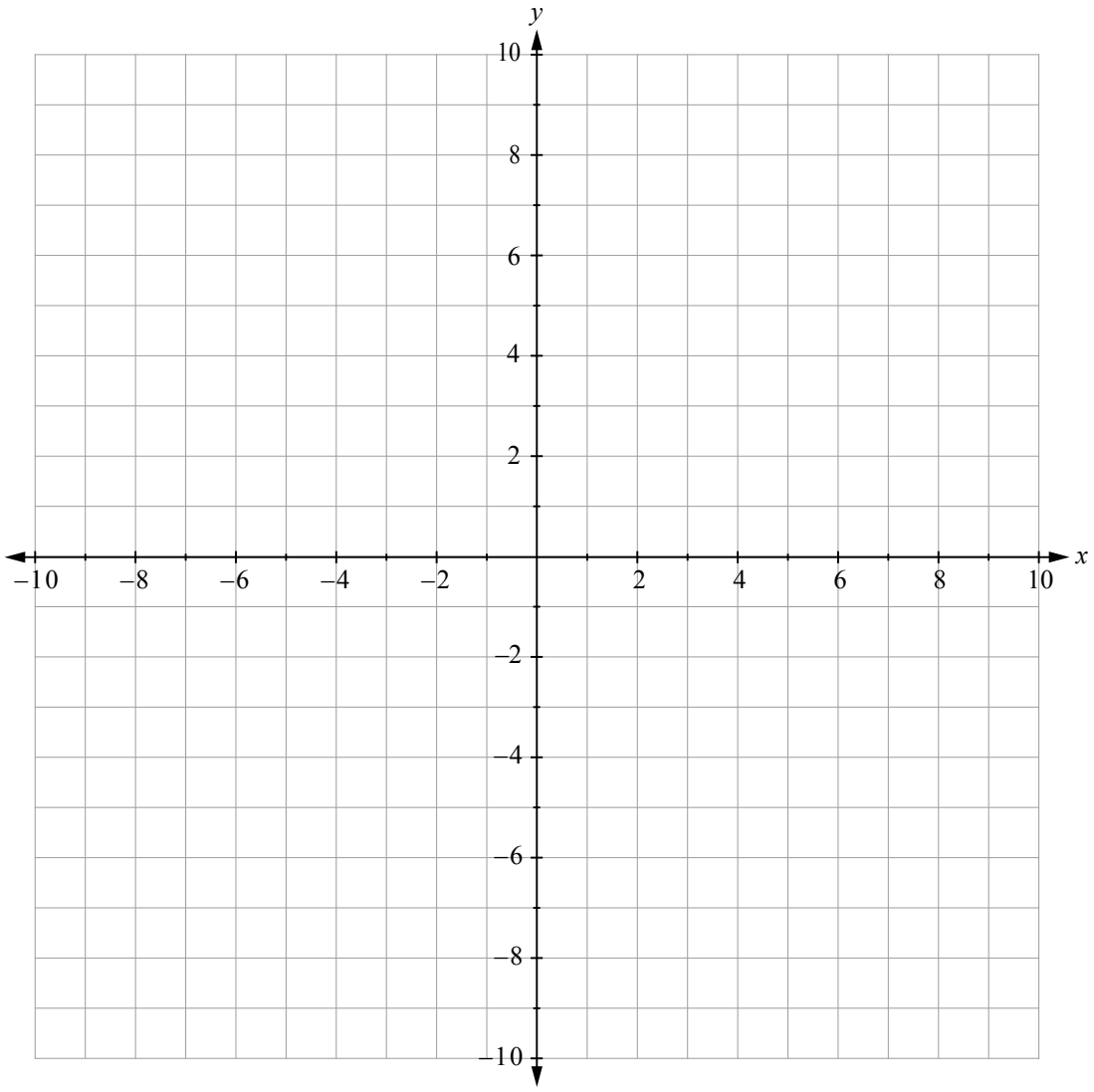
Assessor's use only

QUESTION ONE

If you need to redraw this graph, use page 12, 13 or 14.

Sketch the graph of $y^2 = -8x$.

Label features such as intercepts, asymptotes and foci.



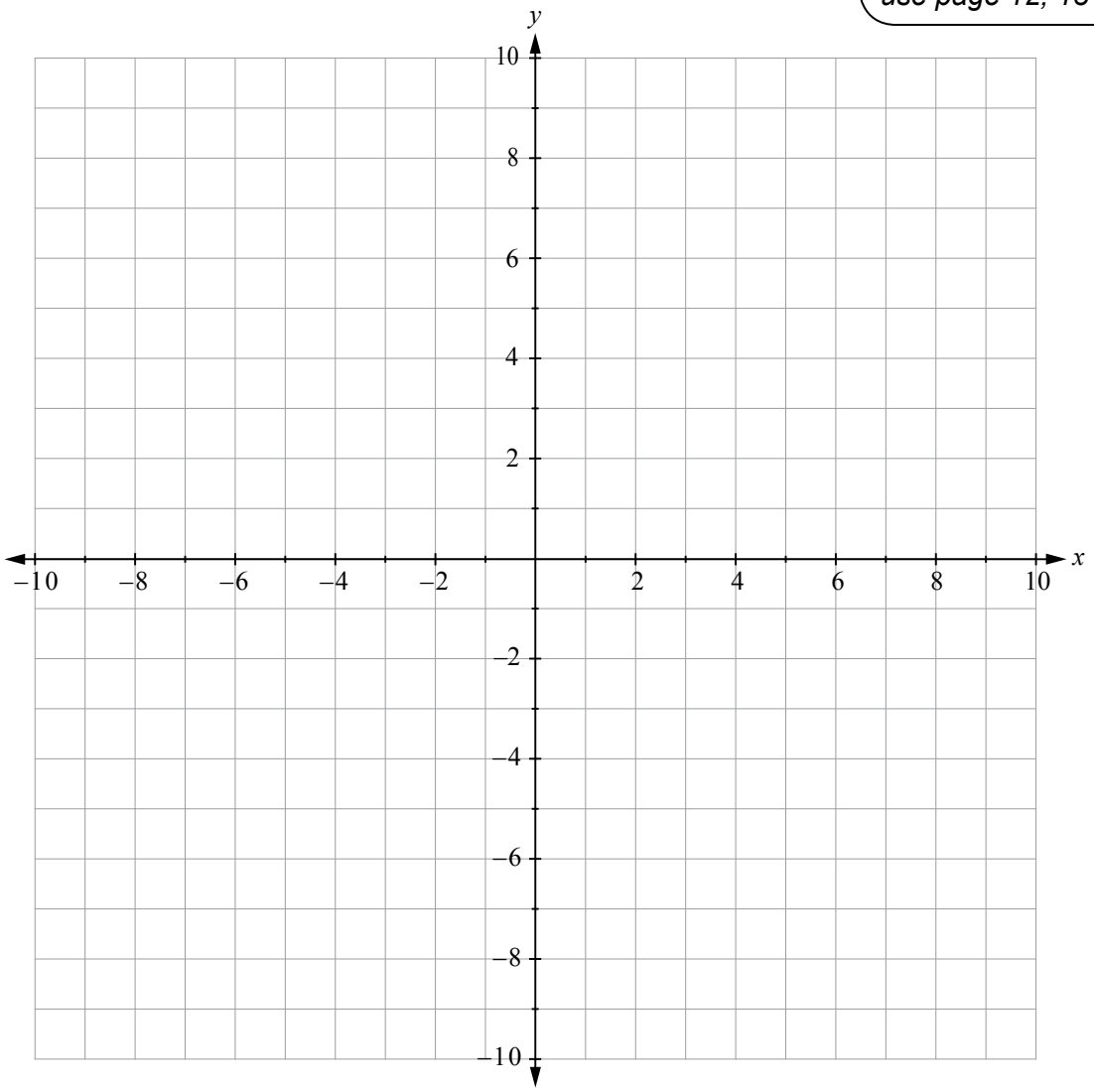
QUESTION TWO

Assessor's use only

Sketch the graph of $x^2 + y^2 + 8x - 10y + 16 = 0$.

Label features such as intercepts, asymptotes and foci.

If you need to redraw this graph, use page 12, 13 or 14.



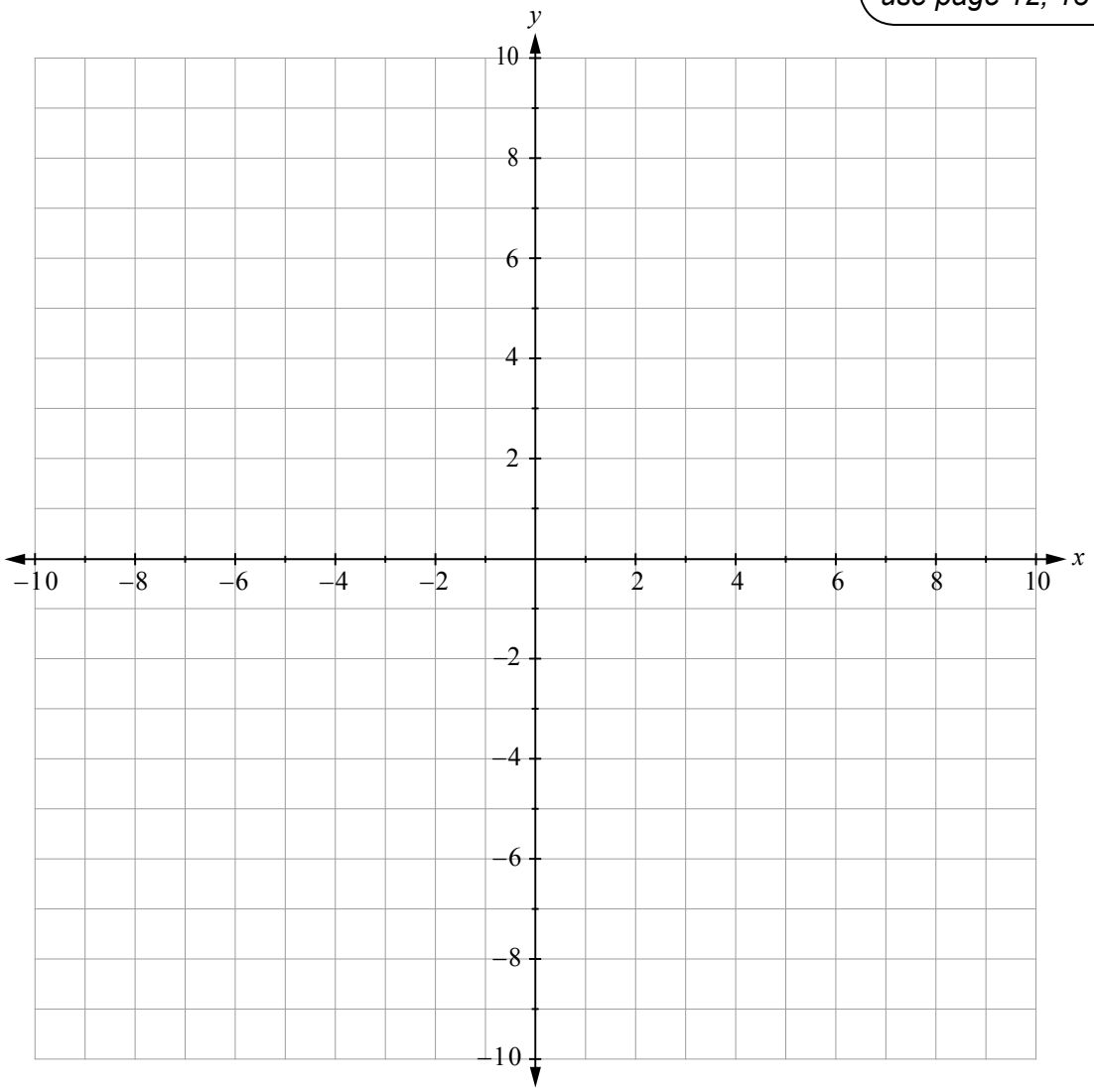
QUESTION THREE

Assessor's use only

Sketch the graph of the curve defined by $x = 4\cos t$, $y = 3\sin t$.

Label features such as intercepts, asymptotes and foci.

If you need to redraw this graph, use page 12, 13 or 14.

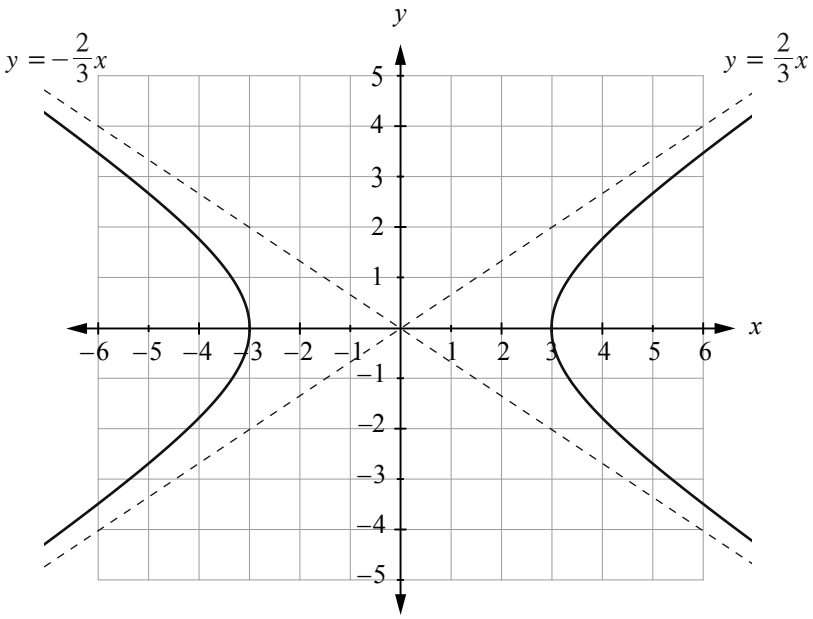


QUESTION FOUR

Assessor's use only

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

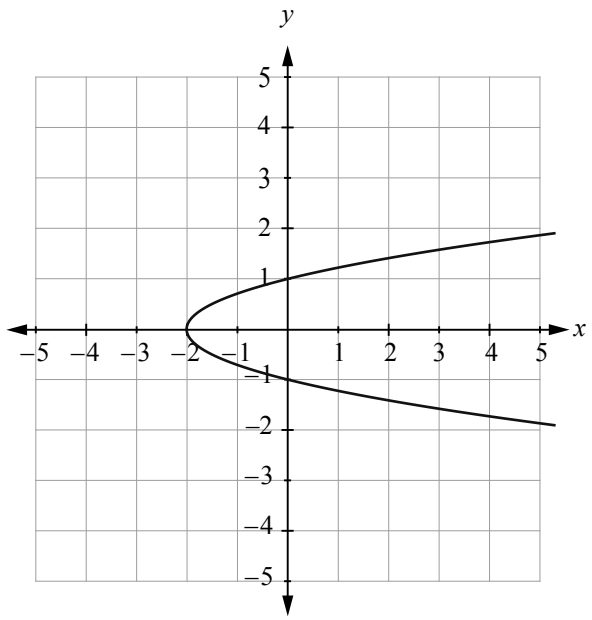
Write the equation in Cartesian form.



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

Write the equation in Cartesian form.

Assessor's use only



QUESTION FIVE

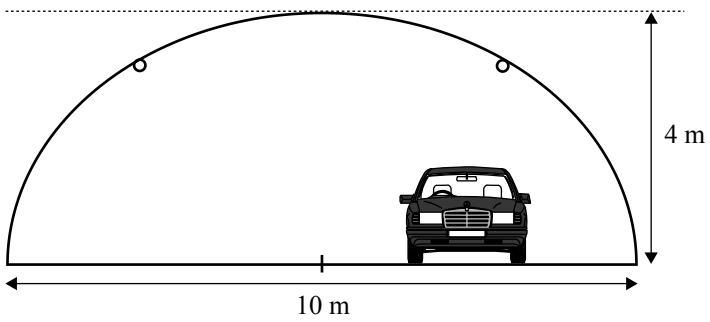
Assessor's use only

Find the equation of the tangent to the hyperbola $\frac{x^2}{3} - \frac{y^2}{8} = 1$ at the point (3,4).

QUESTION SIX

Assessor's use only

The cross-section of a road tunnel for cars has the shape of the top half of an ellipse.



The tunnel is 10 metres wide at the level of the road.

Its highest point is 4 metres above the road.

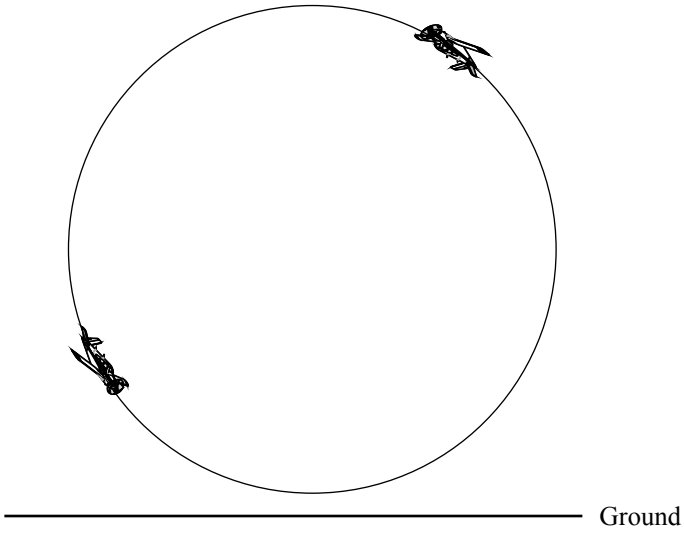
Lights are located on the roof of the tunnel above each focus of the ellipse.

Calculate the height of the lights above the road.

QUESTION SEVEN

Assessor's use only

Two pilots were performing stunts at an air show.
Their planes were following each other in a circular path in the vertical plane.



The heights of the planes above the ground ranged from a minimum of 100 metres to a maximum of 1800 metres.

When one plane was 1500 metres above the ground, the other was 500 metres above the ground on the other side of the circle.

Calculate the distance between the two planes when they were in this position.

QUESTION EIGHT

Assessor's use only

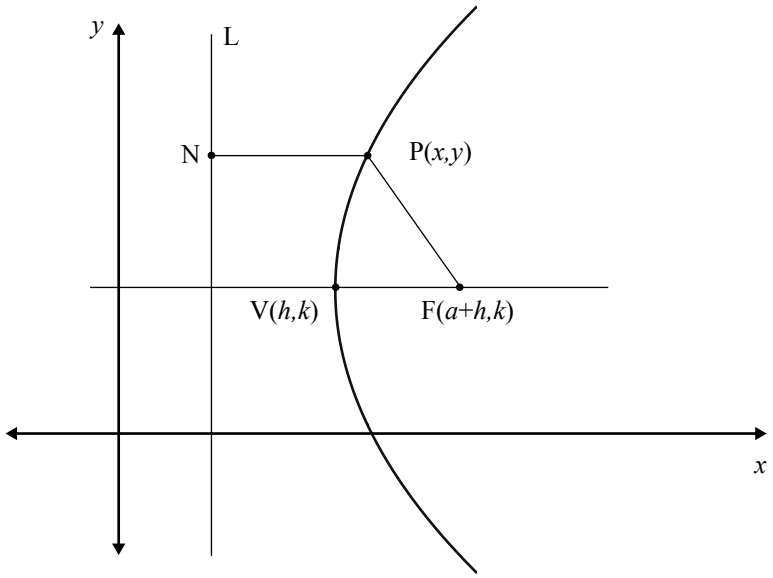
Any parabola can be defined as the locus of a point, which moves so that it is equidistant from a fixed point, the focus, and a fixed line, the directrix.

One such parabola has its vertex at V(h,k) and focus at F(a+h,k).

P(x,y) is a point on the parabola.

L is the directrix of the parabola.

PN is the perpendicular from P(x,y) to L the directrix.



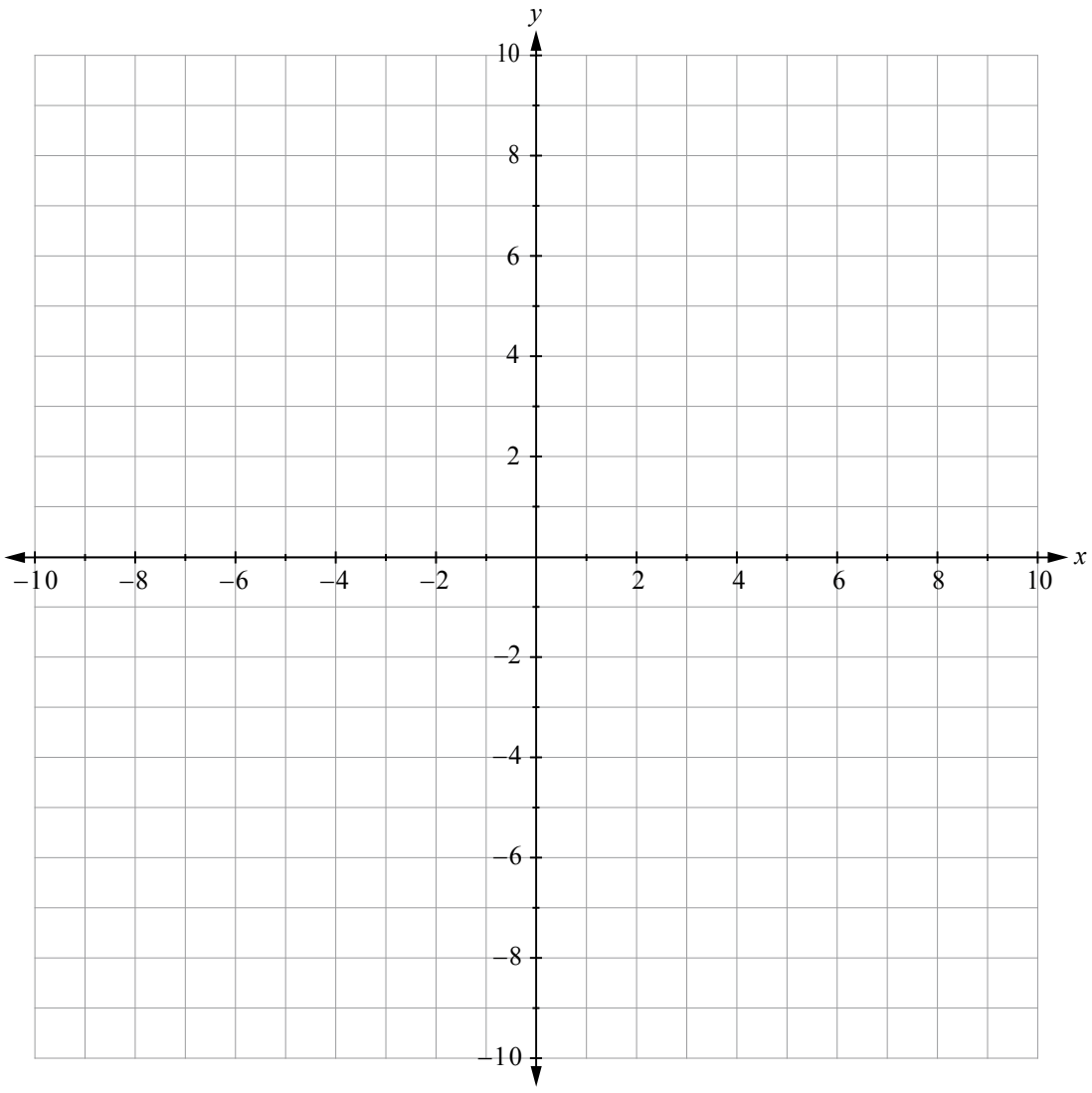
Write expressions for the lengths PN and PF.

Use them to show that the equation of the parabola is $(y - k)^2 = 4a(x - h)$.

Assessor's use only

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

Assessor's use only



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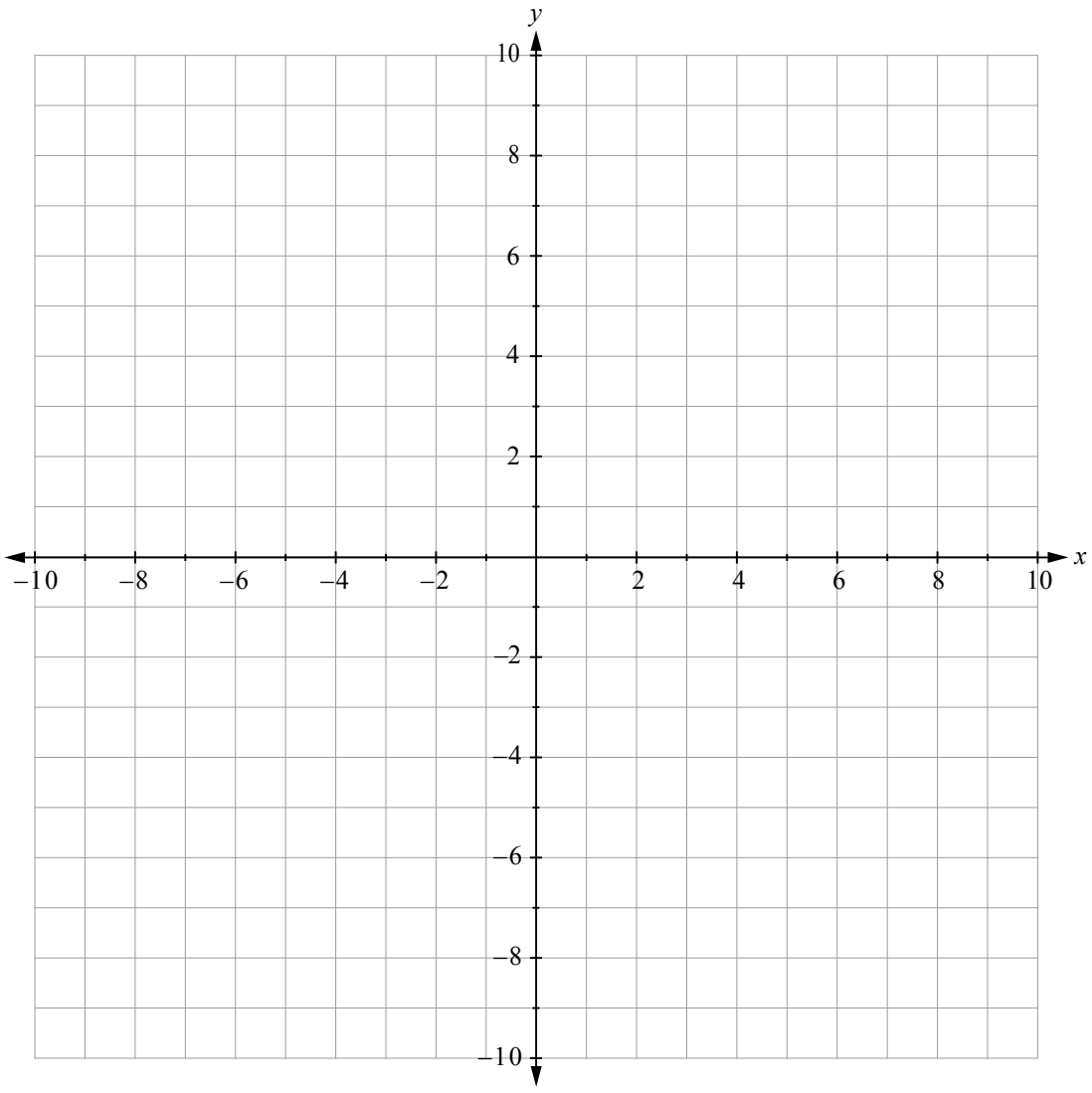

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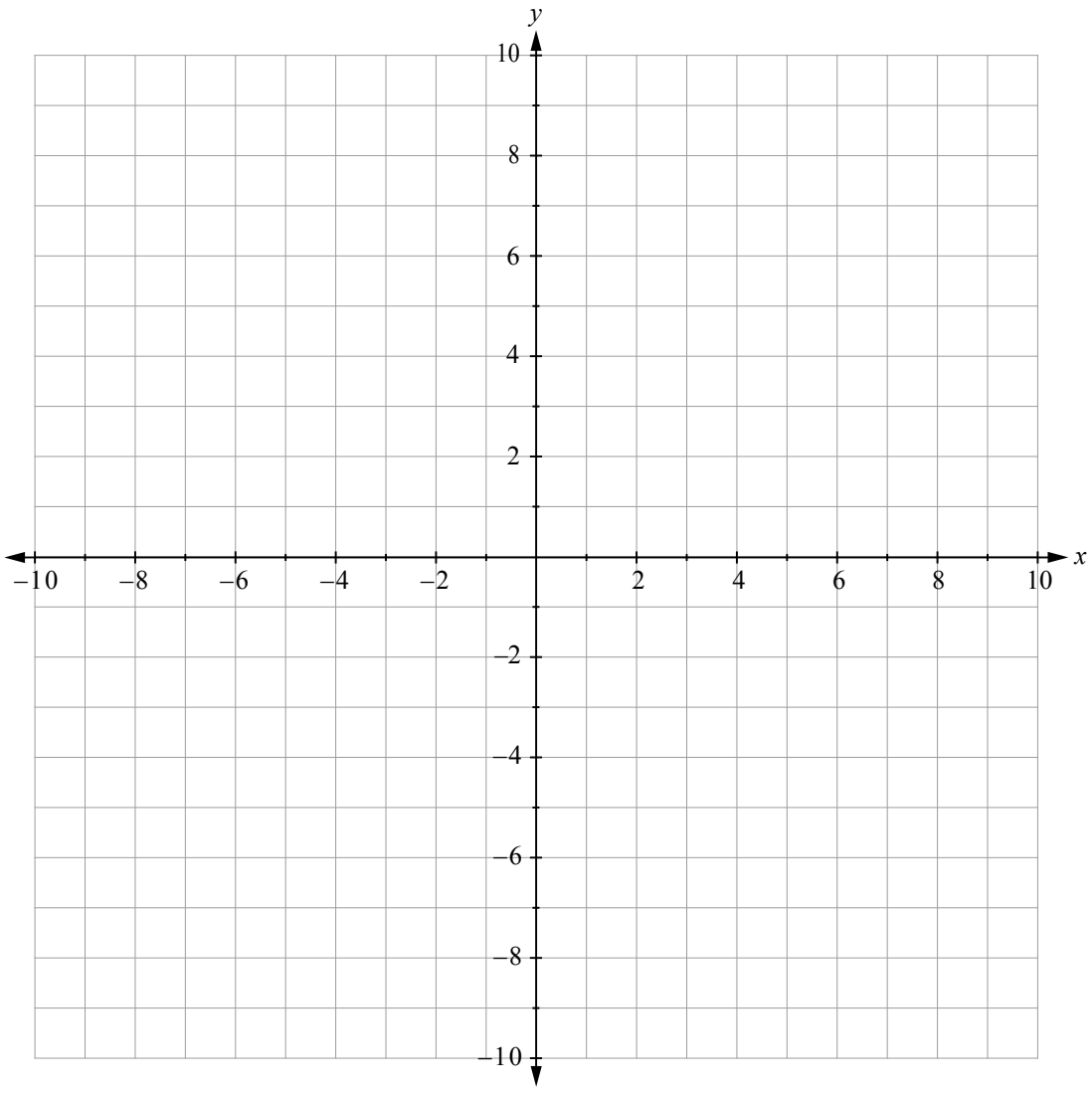

Extra paper for continuation of answers if required.
Clearly number the question.

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