



The **topics** and **types of questions** examined in this Achievement Standard. Use this sheet to plan and organise your study so that you cover everything that is required.

**FREE DOWNLOADS:** For more of these Revision Checklists visit [www.studypass.co.nz](http://www.studypass.co.nz)



Copyright © 2009 Growing Minds Ltd.

**NCEA Study Packs** contain the past NCEA questions for all exams for each of these topics. Full answers, explanations and a set of summary course notes. View all titles at [www.studypass.co.nz](http://www.studypass.co.nz)



**3.5 CONIC SECTIONS**

**AS 90639**

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

**3.5 1. Sketch graphs of conic sections**

**A**

- circle, ellipse, parabola and hyperbola
- appropriate features indicated e.g. asymptotes and intercepts
- equations may be in Cartesian or parametric form

► Sketch the graph of the following equations. Label any features such as intercepts and asymptotes.

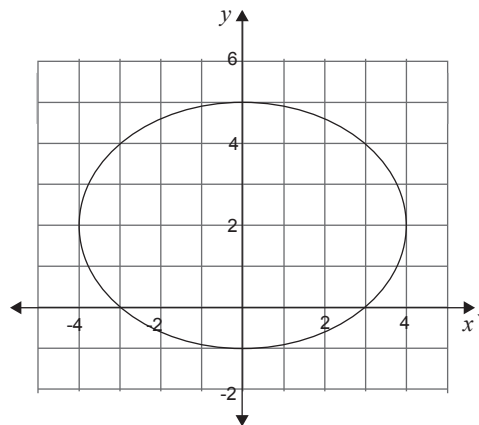
- (a)  $x^2 + y^2 - 4x + 6y + 9 = 0$       (b)  $x = 2 \sec t, y = 6 \tan t$   
 (c)  $4x^2 + y^2 = 64.$                       (d)  $(y - 4)^2 = 8(x + 2)$

**3.5 2. Write equations of conic sections**

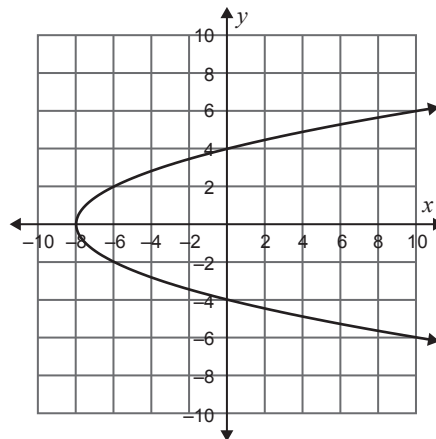
**A**

- circle, ellipse, parabola and hyperbola

► Find the equation of the conic section shown below.



► Find the equations of the conic section shown below.



**3.5 3. Finding tangents, normals, points of intersection**

**M**

- implicit or parametric differentiation may be required

► A circle has the equation  $x^2 + (y - 3)^2 = 16$ .

- (a) What are the coordinates of the centre of the circle?  
 (b) Prove that the line  $y = 7$  is a tangent to the circle.  
 (c) What is the equation of the other horizontal tangent?  
 (d) The line  $y = x + 3$  cuts the circle in two points. Find the coordinates of these points.

► A curve is given by the equations:  $x = 9 \cos \theta + 2, y = 9 \sin \theta$

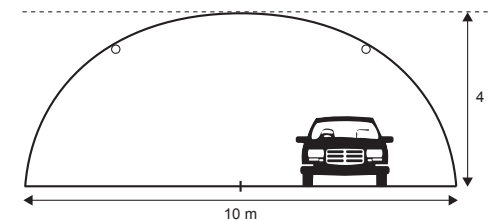
Find the equation of the tangent to this curve at the point where  $\theta = \frac{\pi}{4}$

**3.5 4. Modelling with conic sections**

**M**

- contexts such as: bridges, cross-sections of tunnels, profiles of shadows, ovals, cross-sections of punch bowls

► 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.

**3.5 5. Solve more complex problems**

**E**

- may involve a proof, a chain of reasoning, loci, knowledge of eccentricity or directrix

► A satellite has a pair of signal reflectors that could be defined by part of a hyperbola with equation  $9x^2 - 4y^2 = 36$  relative to the centre of the satellite.

A monitoring camera is positioned at the point (1, 3).

There is one line of sight from the camera to each of the signal reflectors. Each line of sight forms a tangent to a signal reflector.

Find the equation of each of the tangents from the camera to the signal reflectors.