



QUESTION WORKBOOK

Tangents, normals and loci of conics

Further Pure 1 · Year FM

6 questions · 23 marks

PRINT EDITION

SECTION A · Warm-up

- A1** Write down the equation of the tangent to $y^2 = 4ax$ at the point $(at^2, 2at)$, and state the gradient of the normal there. [2]

- A2** Find the equation of the tangent to $y^2 = 16x$ at the point where $t = 2$. [3]

SECTION B · Standard

- B1** Show that $y = 2x + 2$ is a tangent to $y^2 = 16x$, and find the point of contact. [4]

- B2** Find the equations of the tangent and the normal to $xy = 16$ at the point $(4, 4)$. [4]

B3 Find the locus of the midpoints of chords of $y^2 = 16x$ that have gradient 4. [4]

SECTION C · Stretch

C1 The point $P(at^2, 2at)$ lies on the parabola $y^2 = 4ax$, where $t \neq 0$. The normal at P meets the parabola again at $Q(aT^2, 2aT)$. Show that $T = -t - 2/t$. Hence find Q when $a = 4$ and $t = 1$. [6]