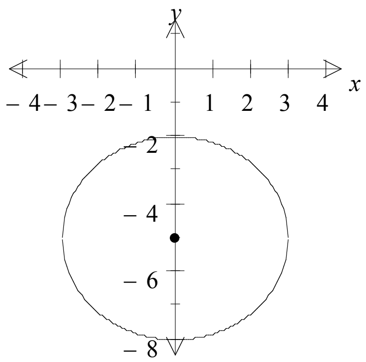
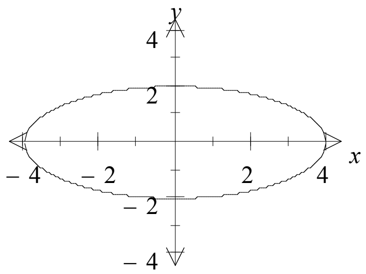
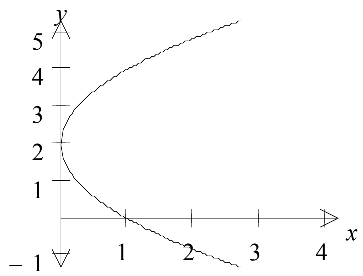
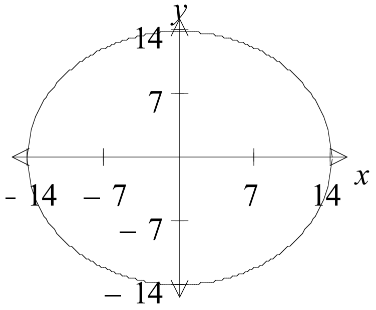
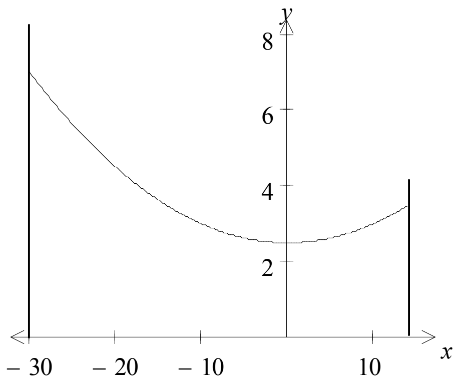
ASSESSMENT SCHEDULE (Sample)

Mathematics with Calculus: Sketch graphs and find equations of conic sections (90639)

	Achievement Criteria	No	Evidence	Code	Judgement	Sufficiency
ACHIEVEMENT	Sketch graphs of conic sections.	One	$x^2 + (y + 5)^2 = 9$ 	A1	Centre and intercepts indicated by sketch. Circle drawn through (0, –2), (0, –8).	**ACHIEVEMENT:** Two of Code A1 **and** Two of Code A2
		Two	$\frac{x^2}{16} + \frac{y^2}{4} = 1$ 	A1	Centre and intercepts indicated by sketch. Ellipse through (–4,0), (0,2), (4,0), (0,–2).	
		Three	$(y - 2)^2 = 4x$ 	A1	Vertex and intercepts indicated by sketch. Parabola through (1,0), (0,2)	

	Achievement Criteria	No	Evidence	Code	Judgement	Sufficiency
ACHIEVEMENT	Find equations of conic sections from given information.	Four (a)	Circle: $(x-4)^2+(y-2)^2=9$	A2	Or equivalent.	**ACHIEVEMENT:** Two of Code A1 **and** Two of Code A2
		(b)	Ellipse: $\frac{(x-3)^2}{9}+\frac{(y-4)^2}{4}=1$	A2	Or equivalent.	
		(c)	Hyperbola: $\frac{x^2}{36}-\frac{y^2}{b^2}=1$ $\frac{100}{36}-\frac{16}{b^2}=1$ $\frac{16}{9}=\frac{16}{b^2}$ $b^2=9$ $\therefore$ Equation of Hyperbola: $\frac{x^2}{36}-\frac{y^2}{9}=1$	A2	Or equivalent.	

	Achievement Criteria	No	Evidence	Code	Judgement	Sufficiency
MERIT	Solve problems involving conic sections.	Five	$x = 2\cos 2t$ $\quad y = 2\sin t$ $\frac{dx}{dt} = -4\sin 2t$ $\quad \frac{dy}{dt} = 2\cos t$ $\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx}$ $= -\frac{1}{4} \times \frac{1}{\sin t}$ At (1,1) $\quad \sin t = \frac{1}{2}$ $\frac{dy}{dx} = -\frac{1}{2}$. Equation of tangent: $x + 2y - 3 = 0$ **or** $\quad y = -\frac{1}{2}x + \frac{3}{2}$ **OR** $x = 2\cos 2t$ $\quad y = 2\sin t$ $y^2 = 2 - x$ Differentiating implicitly: $2y \times \frac{dy}{dx} = -1$ $\frac{dy}{dx} = \frac{-1}{2y}$ At (1,1): $\quad \frac{dy}{dx} = -\frac{1}{2}$. Equation: $\frac{y-1}{x-1} = -\frac{1}{2}$ $x + 2y - 3 = 0$ **or** $y = -\frac{1}{2}x + \frac{3}{2}$	M	$\frac{dy}{dx}$ Stated. Gradient of tangent evaluated. Equation of tangent written.	**Merit:** Achievement **plus** Two of Code M **or** All three Code M

	Achievement Criteria	No	Evidence	Code	Judgement	Sufficiency
MERIT	Solve conic section problems.	Six	Equation of circle: $x^2 + y^2 = 196$		Equation of circle stated.	**MERIT:** Achievement **plus** Two of Code M **or** All three Code M
					Graph drawn.	
			Solve for x when $y = –12$ $x^2 + (-12)^2 = 196$ $x^2 = 52$ $x = \sqrt{52}$ Area of base $= \pi r^2$ $= 52\pi \approx 163.4$ cm^2	M	Radius of base calculated and substituted into area formula. Or equivalent. Units not required.	
		7	Vertex is (0,2.5) so equation of parabola is: $x^2 = k(y - 2.5)$			
				A1	Graph drawn.	
			Equation of parabola: $x^2 = 200\ (y - 2.5)$ or $y = 0.005x^2 + 2.5$	A2	Equation of parabola stated.	
			$y = 3.48$ at right hand post: $x^2 = 200\ (3.48 - 2.5)$ $x = 14$ The posts are 44 metres apart.	M	Distance between the posts is clearly stated.	

	Achievement Criteria	No	Evidence	Code	Judgement	Sufficiency
EXCELLENCE	Solve more difficult conic section problems.	Eight (a)	Differentiating implicitly gives: $\frac{dy}{dx} = \frac{-b^2 x}{a^2 y}$ At P($a\cos\theta$, $b\sin\theta$): $\frac{dy}{dx} = \frac{-b\cos\theta}{a\sin\theta}$ Equation of normal: $\frac{y - b\sin\theta}{x - a\cos\theta} = \frac{a\sin\theta}{b\cos\theta}$ $by\cos\theta - b^2\sin\theta\cos\theta = ax\sin\theta - a^2\sin\theta\cos\theta$ $ax\sin\theta - by\cos\theta = (a^2 - b^2)\sin\theta\cos\theta$.	M E	Gradient function is found. Point and normal gradient are substituted.	**EXCELLENCE:** Merit **plus** Both Code E
		(b)	According to the result from Eight (a): Any normal to $\frac{x^2}{25} + \frac{y^2}{9} = 1$ has the equation $5x\sin\theta - 3y\cos\theta = 16\sin\theta\cos\theta$. A: x-intercept: $(\frac{16}{5}\cos\theta, 0)$ B: y-intercept: $(0, \frac{-16}{3}\sin\theta)$ Midpoint of AB: $(\frac{8}{5}\cos\theta, \frac{-8}{3}\sin\theta)$ Equation of ellipse formed by the locus of midpoints of AB: $\frac{25x^2}{64} + \frac{9y^2}{64} = 1$ or $25x^2 + 9y^2 = 64$	A2 M E	Equation of ellipse stated.	