

Check Your Understanding: Answers

1. Create a table that displays all of the standard forms of the equations of the conics. Include information about the foci, vertices, asymptotes, and so on.

	Circle	Ellipse	Parabola	Hyperbola
	centre (0, 0)	centre (0, 0)	vertex (0, 0)	centre (0, 0)
standard form	$x^2 + y^2 = r^2$	foci on x-axis ($a > b$): $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	opens right or left: $y^2 = 4px$	foci on x-axis: $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$
foci		($\pm c$, 0)	(p , 0)	($\pm c$, 0)
vertices		($\pm a$, 0)	(0, 0) directrix is $x = -p$	($\pm a$, 0)
asymptotes				$y = \pm \frac{b}{a} x$
standard form		foci on y-axis ($a > b$): $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$	opens up or down: $x^2 = 4py$	foci on y-axis: $\frac{x^2}{b^2} - \frac{y^2}{a^2} = -1$
foci		(0, $\pm c$)	(0, p)	(0, $\pm c$)
vertices		(0, $\pm a$)	(0, 0) directrix is $y = -p$	(0, $\pm a$)
asymptotes				$y = \pm \frac{a}{b} x$
	centre (h , k)	centre (h , k)	vertex (h , k)	centre (h , k)
standard form	$(x - h)^2 + (y - k)^2 = r^2$	For a horizontal major axis, $a > b$, $\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1$	opens up or down: $(x - h)^2 = 4p(y - k)$	$\frac{(x - h)^2}{a^2} - \frac{(y - k)^2}{b^2} = 1$
standard form		For a vertical major axis, $a > b$, $\frac{(x - h)^2}{b^2} + \frac{(y - k)^2}{a^2} = 1$	opens left or right: $(y - k)^2 = 4p(x - h)$	$\frac{(x - h)^2}{b^2} - \frac{(y - k)^2}{a^2} = 1$
distance from vertex to focus			p	
axes		major axis = $2a$ minor axis = $2b$		transverse axis = $2a$ conjugate axis = $2b$
a , b , c		$a^2 = b^2 + c^2$		$c^2 = a^2 + b^2$

2. The equation of any conic has the general form $ax^2 + by^2 + 2gx + 2fy + C = 0$. Create a table to show the restrictions on these values for each of the four conics. For example, for a circle, $a = b$.

circle	$a = b$
ellipse	$ab > 0$
hyperbola	$ab < 0$
parabola	$ab = 0$

3. Explain “asymptote” in your own words. Draw several graphs that have asymptotes.

An asymptote is a line that a relation approaches but does not cross. The graph on page 613 shows an asymptote.

4. Describe the procedure for finding the intersection of a line and a conic.

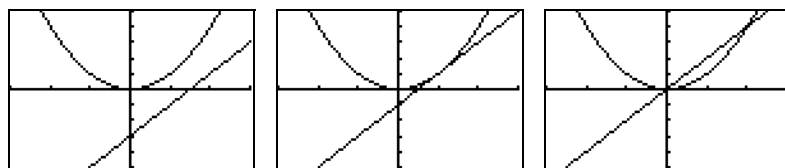
(a) What things do you need to consider?

Consider the number of solutions (none, one, or two), the equations of the relations, a sketch or diagram, the different methods for solving the system of equations.

(b) What different situations could arise?

The solutions may be complex numbers (no solutions), a line may be tangent to a conic (one solution), or the line can only intersect a conic at exactly two points. In each case, there may be many lines that meet the criteria.

(c) Draw diagrams to show the different cases.



5. In your own words, explain the purpose of a locus definition.

The locus definition outlines the basic information for drawing, graphing, constructing, or creating a mathematical expression for a mathematical object.

6. Draw diagrams to show the reflective properties of the conics.

For example, in the diagram shown, each line that is parallel to the axis of symmetry is reflected in the curve of the parabola such that the angle of reflection is equal to the angle of deflection. The result is that if a marble were rolled along any one of these lines the marble would be deflected through the focus.

A diagram on page 605 of the textbook also shows how car headlights use the reflective properties of conics to amplify or diminish the strength of a beam of light.

