(1) A curve has parametric equations

$$x = 4t^{1/3}, \qquad t \in R$$
$$y = t^2 - 64$$

Find where the curve crosses the coordinate axes.

(2) A curve has parametric equations

$$x = 3(t - 1),$$
$$y = \ln(t + 5)$$

(a) Explain why the domain needs to be restricted.

The domain is restricted such that $t > -3$

(b) Find where the curve crosses the coordinate axes.

(3) A curve has parametric equations

$$x = 2 + 3 \cos 2t, \qquad 0 \le t \le 2\pi$$
$$y = 4 - \sin t$$

(a) Show that the cartesian equation for the curve can be written as $(y + a)^2 = b(c - x)$
(b) State the domain and the range of the cartesian function.
A 3D printer is used to make an 'arrowhead' for an expensive safety spear for a child's game. The graph of the parametric equations is sketched below.
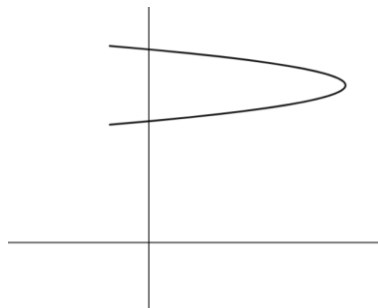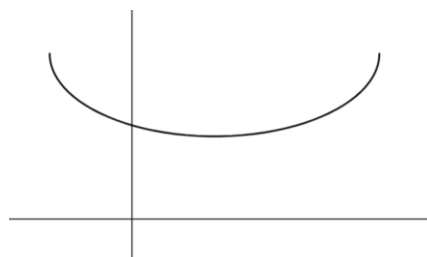

(c) Given that one unit = 4cm, find the length of spear head. (The length is the to the tip of the spear)
(d) Find the maximum width of the spear head.

(4) Derek is making a shallow bowl on a 4D printer for some fruit punch he will have at a party. The bowl is modelled by the parametric equations:

$$x = 1 + 2 \cos t, \qquad \pi \le t \le 2\pi$$
$$y = 2 + \sin t$$

A diagram of the bowl is shown below.

(a) Find the width of the opening of the bowl.
(b) Find the depth of the bowl.
(c) By finding the Cartesian equation, show that the cross section of the bowl is not a hemisphere.