Problem 1. Consider the differential equation with the following initial condition:

$$y' = y, y(0) = 1$$

Estimate $y(1)$ using Euler's Method taking a step size of 0.5 ($h = 0.5$).

Problem 2. Consider the parametric equations:

$$x(t) = a\cos(t)$$
$$y(t) = b\sin(t)$$

Let (x.y) denote the position of a particle in a horizontal plane and let t be the time that passes.

(a) Trace out the particle's trajectory from $0 < t < 2\pi$. Include arrows to specify the direction in your graph.

(b) Show that the total distance, S, the particle travels from $0 < t < 2\pi$ can be written as:

$$S = 4b \int_0^{\frac{\pi}{2}} \sqrt{1 + e^2 \sin^2(t)} dt$$

Take $a > b > 0$. Define $c = \sqrt{a^2 - b^2}$ and $e = \frac{c}{b}$.