MA104 - Differential Calculus
Lesson 28: Parametric Equations I

1. Use the table below to fill in values to help you plot (including arrows indicating direction) the parametric curve given by

$$x = \sin(t), y = \sin(2t), \quad 0 \leq t \leq 2\pi$$

t	$x(t)$	$y(t)$
0		
$\frac{\pi}{2}$		
π		
$\frac{3\pi}{2}$		
2π		

Mathematica Commands:

```
x[t_]=Sin[t]
y[t_]=Sin[2t]
```

Plotting: `ParametricPlot[{x[t],y[t]},{t,0,2*Pi}]`
Animating: `Animate[ParametricPlot[{x[t],y[t]},{t,0,T},PlotRange->{{-2,2},{-2,2}}], {T,0,2*Pi,0.1}]`

2. Notes on Circles:

3. Eliminating the parameter - Two types: trig and not trig...

   (a) $x = 1 + 3t$, $y = 2 - t^2$

   (b) $x = 4\cos(\theta)$, $y = 4\sin(\theta)$

Problems

1. Sketch the following curves by hand or with Mathematica. Indicate with an arrow the direction in which the curve is traced as the parameter increases.

   (a) $\begin{aligned} x &= \sqrt{t} \\ y &= 1 - t \end{aligned}$

   (b) $\begin{aligned} x &= 1 + \sin(t) \\ y &= 5\cos(t) \end{aligned}$, $0 \leq t \leq 2\pi$.

   (c) $\langle \sqrt{s}, \sin(s) \rangle$, $0 \leq s \leq 3\pi$.

2. For each of the parametric equations above, eliminate the parameter to find a Cartesian equation of the curve.

   (a)

   (b)

   (c)