2E2 Tutorial Sheet 16 Second Term[1]

26 February 2006

Useful facts:

- Convert into y_1, y_2 form.
- Find the stationary points, these are where $y_1' = y_2' = 0$.
- Approximate near the stationary points, drop squares and cubes, use $\sin\theta \approx \theta$ for small θ.
- The arrows will go left to right above the y_1-axis and right to left below it.
- For the trigonometry tables

$$\begin{aligned} \cos\left(\frac{\pi}{2}+\theta\right) &= -\sin\theta \\ \cos\left(3\frac{\pi}{2}+\theta\right) &= \sin\theta \end{aligned} \tag{1}$$

Questions:

1. (4) By linearizing around the critical points, draw the phase plane portrait of

$$y'' + y - y^3 = 0 \tag{2}$$

2. (4) By linearizing around the critical points, draw the phase plane portrait of

$$y'' = \cos 2y \tag{3}$$

[1]Conor Houghton, houghton@maths.tcd.ie and http://www.maths.tcd.ie/~houghton/ 2E2.html