Comments on Maple Problem Set F, Problems 5 and 12

Be sure to read the instructions for the problems carefully and do all parts. You must use Maple on these problems. Do not use pplane5 to do them. (Of course, if you want to use pplane5 to help you see what to expect from Maple, that's OK–but the solutions you hand in cannot use pplane5).

You can use either **DEplot** (see p. 169 of *Differential Equations with Maple*) or odeplot to plot numerical solutions of systems. There are probably other ways as well. Here is how to do this with **odeplot** for a system of two equations. Of course, you have to give specific funtions f and g, values for m, n, and you may want to adjust the range of t, and the starting values of a, b.

```
> with(plots):
> sys := diff(x(t),t)=f(x(t),y(t)), diff(y(t),t)=g(x(t),y(t));
> numsol := (a,b) -> dsolve({sys,x(0)=a,y(0)=b},{x(t),y(t)},numeric);
> curve := (a,b,trange) -> odeplot(numsol(a,b),[x(t),y(t)],trange);
> nphase := trange -> display({seq(seq(curve(a,b,trange),a=1..n),b=1..m)});
> nphase(0..10);
```

Problem 5

- You may need to use a fairly large number of points (for example, **numpoints=1000**) in your plot commands to get reasonable plots.
- In part (a), if you get a plot which cannot be correct, please indicate that, and also explain what is wrong with the plot.
- In part (c), you can either differentiate $E(t)$ by hand or have Maple do it. If you have Maple do it, be sure to use $x(t), y(t)$ in your formula for $E(t)$ instead of x, y since otherwise, Maple will think $E(t)$ is a constant function.
- Once you have a formula for the derivative, you need to substitute the formulas for x', y' along a trajectory.
- Parts (b), (f) and (g) require careful thorough explanations.

Problem 12

- In part (b) display the plot from (a) and your approximations to the separatrix on the same plot (using the **display** command). Use a different color (such as **linecolor=gray**) as an option in **DEplot** for your approximations to the separatrix.