

Math 2233
Homework Set 1 Supplement

Below are two sample problems that indicate how to sketch a solution using Maple and how to find a numerical solution using Maple.

1. Sketch the direction fields of the

$$\frac{dx}{dt} = t \sin(x).$$

in the region $0 \leq t \leq 2$, $0 \leq x \leq 2$.

A plot of the direction fields for this differential equation can be produced by Maple using the following commands:

```
with(DEtools);  
dfieldplot(diff(x(t),t) = t*sin(x), [x], t=0..2, x=0..2);
```

2. Construct a numerical solution of the differential equation

$$\frac{dx}{dt} = x^2 t, \forall t \in [0,1].$$

such that

$$x(0) = 1.$$

on the interval $[0,1]$.

```
N:= 1000; #Comment appear below  
t[0] := 0.0; #number of iterations  
x[0] := 1.0; #initial value of t  
#initial value of x  
  
t[N] := 1.0; #final value of t  
dt := (t[N]- t[0])/N; #step size  
  
f := (x,t) -> t*x^2; # the function on the R.H.S.  
# of the differential equation  
  
for i from 1 to N do # start of iterative procedure  
  t[i] := t[i-1] + dt; # next value of t  
  x[i] := x[i-1] + dt*f(x[i-1],t[i-1]); # next value of x  
od;
```

To see a plot of these points you can use the following Maple commands

```
with(plots);  
pointlist := {seq([t[n],x[n]],n=0..1000)}:  
pointplot(pointlist);
```