

Homework and Report for Lesson 2(SAMPLE):

Your Name: Jane Doe
Your Student Number: 348384310
Section Number: 005
Lesson Number: 2 (SAMPLE)

1. Describe the Applied Problem. (1 point)

We wish to be able to predict the temperature of a cooling mass in a room with a known surrounding temperature.

2. State the Differential Equation Model. (1 point)

Let $y(t)$ be the temperature of the cooling mass. Newton's law of cooling requires $y'(t) = c(y_{sur}(t) - y(t))$ where $y_{sur}(t)$, c and $y(0)$ are known.

3. Describe the Numerical Method. (1 point)

The simplest numerical method called the Euler method will be used.

4. Include the Matlab Code. (2 points)

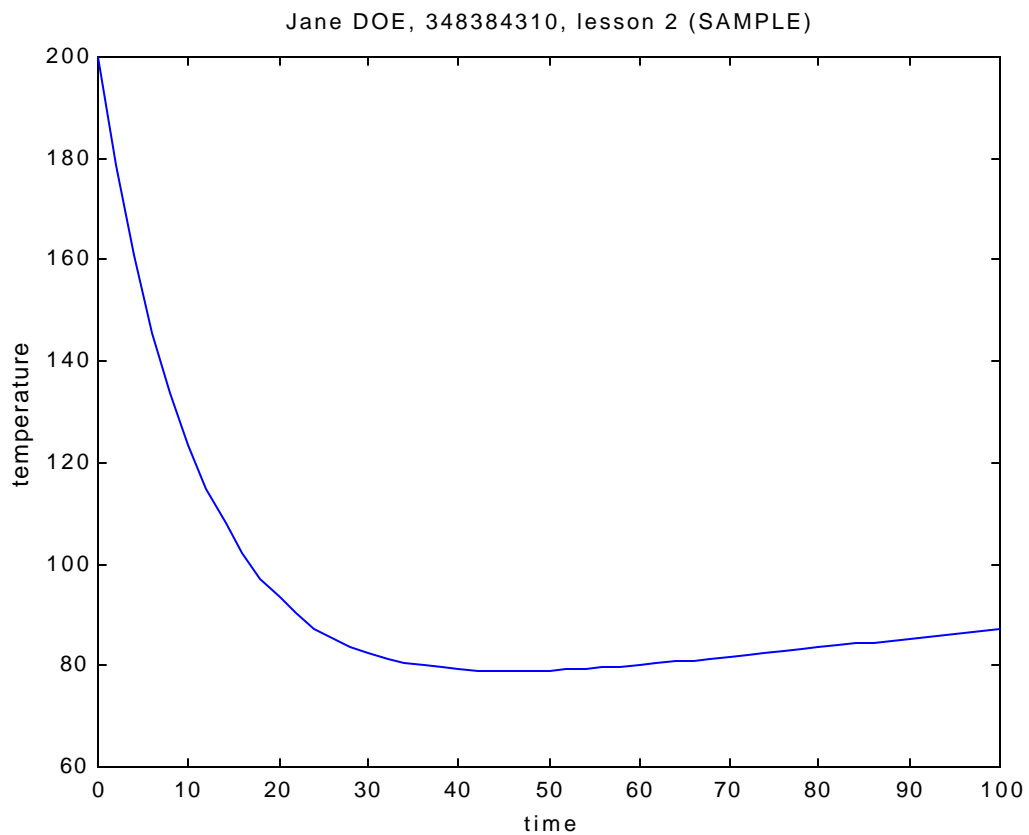
```
function feul = feul(t,x)
    feul = .061*(1+.348384310)*(70.+.t/5 - x);

%Jane Doe, 348384310, lesson 2 (SAMPLE)
clear;
y(1) = 200.;
T = 100;
KK = 50
h = T/KK;
t(1)= 0.;
for k = 1:KK
    y(k+1) = y(k) + h*feul(t(k),y(k));
    t(k+1) = t(k) + h;
end
plot(t,y)
title('Jane DOE, 348384310, lesson 2 (SAMPLE)')
xlabel('time')
ylabel('temperature')
```

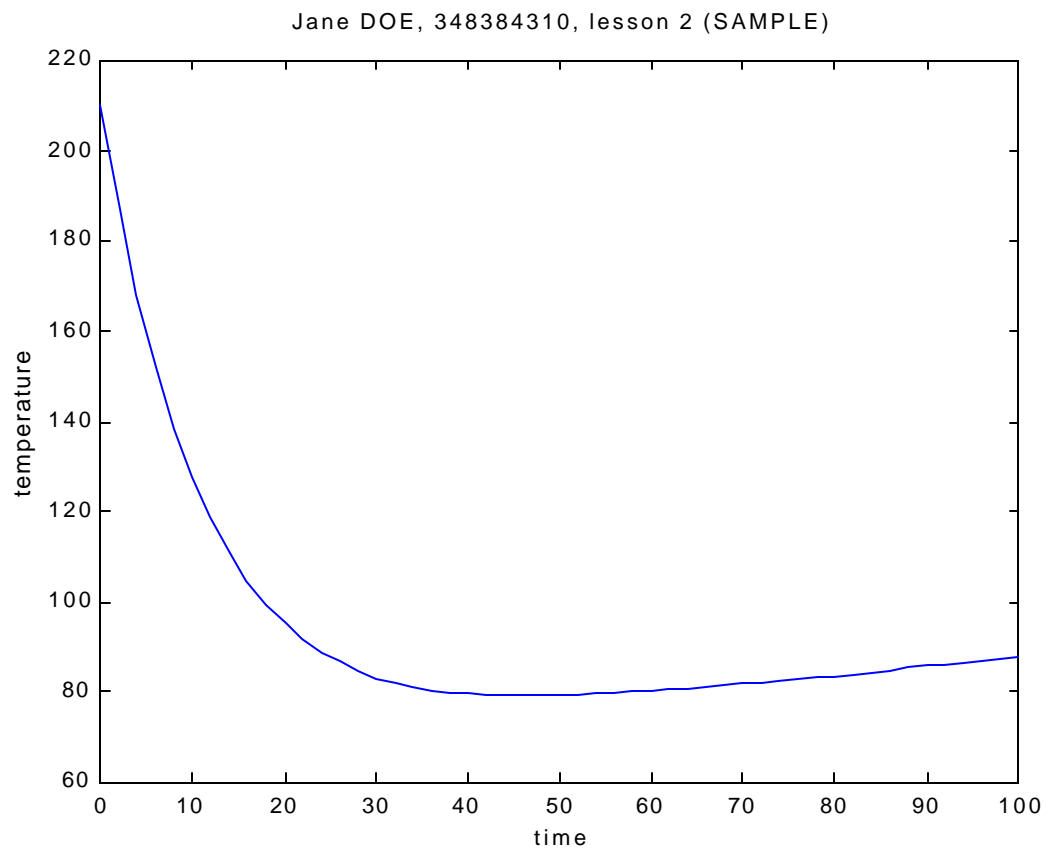
5. Numerical Experiments.

Consider the cooling cup of coffee with variable $y(0)$. Assume the surrounding temperature is $y_{sur}(t) = 70 + t/5$ and $c = .061*(1+S)$.

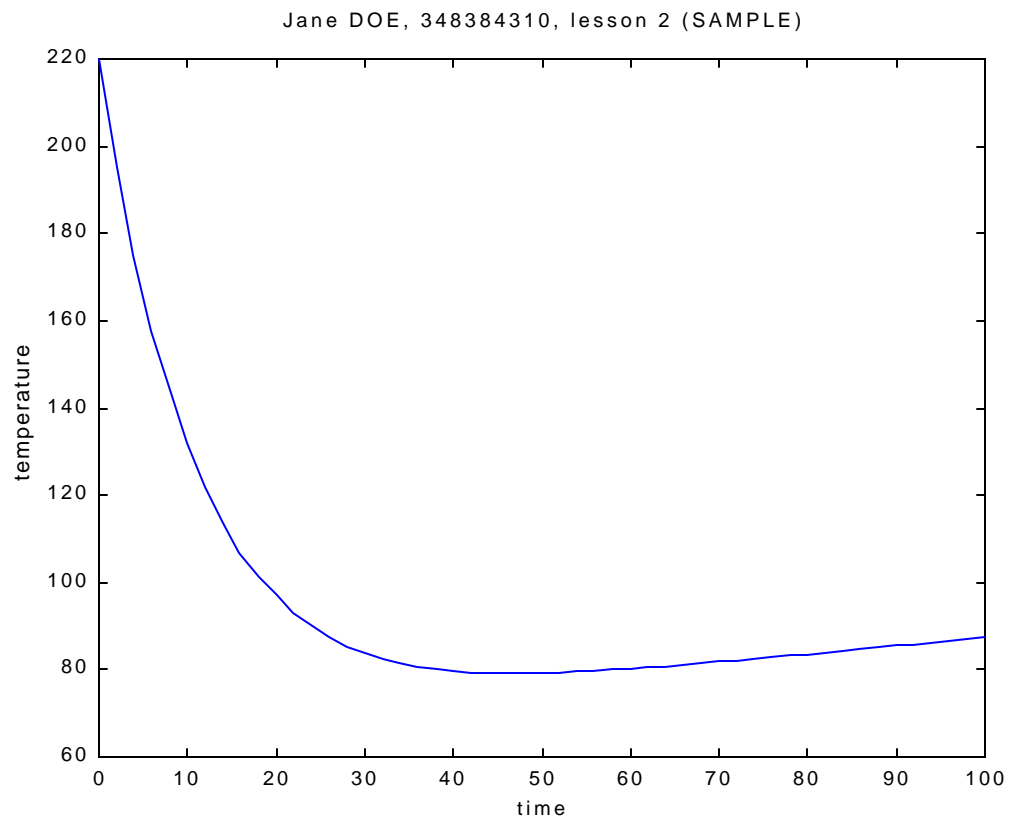
(a). (3 points) Find the solution when $y(0) = 200$.



(b). (3 points) Find the solution when $y(0) = 210$.



(c). (3 points) Find the solution when $y(0) = 220$.



(d). (3 points) What happens when $y(0)$ increases?

The temperature will be larger at all points in time if the initial temperature is larger.

(e). [Extra Credit for 3 points] Repeat part (a) if the surrounding

temperature increases by three degrees every five minutes.

The formula for the surrounding temperature must change to $y_{sur}(t) = 70 + 3*t/5$. So, the second line in feul.m should be `feul = .061*(1+.348384310)*(70.+3*t/5 - x);`
Notice the slope for larger times is larger than in part (a).

