Lab 1 Prelab, Solution (Winter 2011

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Problem Statement

We are given the equation of a line and we want to plot it in MATLAB for different values of a parameter. The best way to do this is as in the example: make a function that takes in a set of time values and the paramter, evaluates the function at all the time values given that parameter, and saving the output. We iterate everything over a for loop.

Solution Code

First we declar the time values and paramter values...

```
t = 0:0.05:5;
a = [0.1 1 10 100];
```

The numel functions tell us how many elements are in a matrix. We'll need these in preallocating a location to save the data.

```
nA = numel(a);
nT = numel(t);
```

The zeros function is used to create a generic space in memory with size requirements for all of the data we will be saving. Each row will correspond to a parameter value and each column will correspond to a time value. So an entire row dictates one line for a single parameter value.

```
sol = zeros(nA,nT);
```

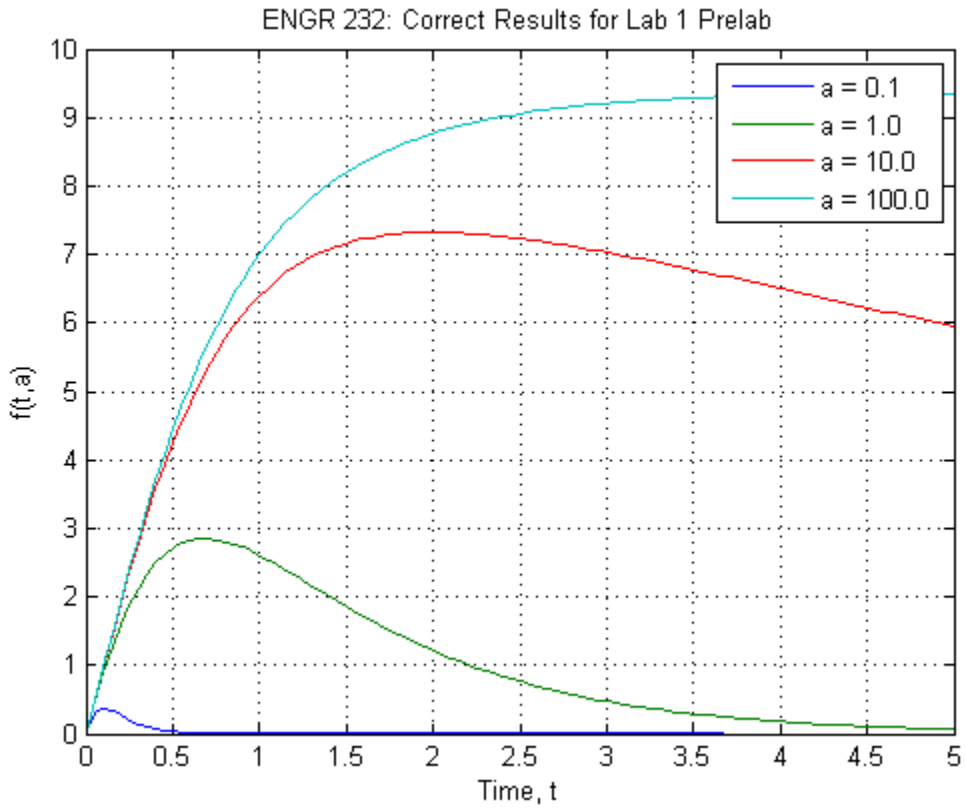
Finally, we iterate across the rows based on how we set everything up. The function was made to accept t = 1xN and a = 1x1. This function is vectorized with dot operators to make us not have to use a second for loop within in.

```
for ii = 1:nA
    sol(ii,:) = Lab1PL(t,a(ii));
end
```

Results

Notice the abbreviated way of plotting the solution. MATLAB will line up the dimensions between t and sol and auto-increment colors between lines.

```
plot(t,sol)
grid on
title('ENGR 232: Correct Results for Lab 1 Prelab')
xlabel('Time, t')
ylabel('f(t,a)')
legend('a = 0.1','a = 1.0','a = 10.0','a = 100.0')
```



Function - L1PL

The dot operator is used every time we have an array of t values either multiplying, dividing, or exponentiating with another array of t values. This signifies that the operation is to be done one-by-one, versus using linear algebra rules as introduced in ENGR 231 for matrix multiplication.

```
type Lab1PL.m
```

```
function y = Lab1PL(t,c)
y = 10*exp(-t/c).*(t./sqrt(1+t.^2));
```

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