1. Modify the Matlab function feuler.m to implement the modified Euler method:

$$y_{n+1}^* = y_n + h f(t_n, y_n)$$
$$y_{n+1} = y_n + \frac{h}{2} \left(f(t_n, y_n) + f(t_{n+1}, y_{n+1}^*) \right)$$

Apply the Euler and modified Euler methods to solve the intial value problem:

$$y' = \frac{2}{t}y + t^2e^t$$
, $1 \le t \le 2$, $y(1) = 0$.

The exact solution is $y(t) = t^2(e^t - e)$.

In Matlab, use the commands in the next page to run feuler.m (and your Matlab function for the modified Euler method).

2. Repeat Q1 using the forth-order Runge-Kutta method.

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MATLAB 7.12.0 (R2011a)
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Shortcuts  How to Add  What's New
  >> tspan=[1,2]; y0=0;
  >> f=inline('2*y/t + t^2*exp(t)', 't', 'y');
  >> yexact=inline('t^2*(exp(t)-exp(1))', 't');
  >> Nh=10;
  >> for k=1:8
          [t,u]=feuler(f,tspan,y0,Nh);
         error(k) = abs(u(end)-feval(yexact, t(end)));
         Nh=2*Nh;
      end
  >> plot(t,u)
  >> p=log(abs(error(1:end-1)./error(2:end)))/log(2)
fx
Start
```