Multiple Choice Questions 11-20 for Lesson 2

1. A discrete model for Newton's Law of Motion is
   (a). \( y_{k+1} - y_k = dt*c*(ysur - y_k) \)
   (b). \( y_{k+1} - y_k = dt*(-32 + k*y_k^2)/m \)
   (c). \( y'(t) = c(ysur - y(t)) \)
   (d). \( y'(t) = (-32 + k y^2)/m \)
   (e). \( y_{k+1} - y = c(-32 - y(t)) \)

2. A continuous model for Newton's Law of Motion is
   (a). \( y_{k+1} - y_k = dt*c*(ysur - y_k) \)
   (b). \( y_{k+1} - y_k = dt*(-32 + k*y*y)/m \)
   (c). \( y'(t) = c(ysur - y(t)) \)
   (d). \( my'(t) = (-32 + k y^2) \)
   (e). \( y_{k+1} - y = c(-32 - y(t)) \)

3. A steady state solution of \( y' = (-32 + y^2) \) is
   (a). \( y(t) = 32 \)
   (b). \( y(t) = 32^{1/2} \)
   (c). \( y(t) = -32 \)
   (d). \( y(t) = e^{-32t} \)
   (e). all of the above

4. A solution of the differential equation \( y' = (-32 + y^2) \) with initial condition \( y(0) = 0 \)
   (a). can be found using separation variables
   (b). can be found using Maple
   (c). can be approximated using Euler method
   (d). can be approximated using improved Euler method
   (e). all of the above

5. In the code file imeuler.m the expression \( y(1) \)
   (a). represents the speed function evaluated at time 1
   (b). represents the position function evaluated at time 1
   (c). the first entry in the \( y \) array whose value is the initial speed
   (d). the first entry in the \( y \) array whose value is the initial position
   (e). a Matlab command
6. The reason for using numerical methods is
   (a). one cannot always find the exact solution
   (b). the graphics are nice
   (c). one can easily experiment with model parameters
   (d). a modern way of doing engineering
   (e). (a) and (c)

7. The improved Euler method is better because
   (a). it is the second variation of the Euler method
   (b). the error is one half the error of the Euler method
   (c). the error is often proportional to the step size squared
   (d). the code is a little longer
   (e). gives better graphics

8. The imeuler.m code is executed by
   (a). first entering fmass at the Matlab prompt
   (b). first entering fmass(1,2) at the Matlab prompt
   (c). entering imeuler(0) at the Matlab prompt
   (d). entering imeuler.m at the Matlab prompt
   (e). entering imeuler at the Matlab prompt

9. The graph of the numerical solution for the speed array, y, versus
   the time array, t, in Matlab can be generated by
   (a). plot(t,speed)
   (b). plot(t,y(10))
   (c). plot(t,y)
   (d). graph(t,speed)
   (e). graph(t,y)

10. The best reason for using a model for falling mass is
    (a). good calculus problem
    (b). good computing problem
    (c). one wants to predict the speed
    (d). allows for repeated experimentation with different
        parameters so as to obtain a desired result
    (e). none, just another Matlab problem