Name:

You have 20 minutes to do this quiz. You may not use any books or notes while you do the quiz nor discuss the quiz with anyone. You may not use a calculator. Show your work clearly.

1. Use Euler’s Method to estimate the solution of $\frac{dy}{dt} = 2t + 3t^2y + 1$. Take the initial value to be $(t_0 = 0, y_0 = 1)$. Take the step size to be $\Delta t = 1$. Take $N = 2$ steps so that you end up at $t = 2$. What are the $y$ values you get for $t = 1$ and for $t = 2$. Make a plot of your values $(t_0, y_0), (t_1, y_1), (t_2, y_2)$.

2. For $\frac{dy}{dt} = f(y) = y^2 - y - 6$
   a. Determine the equilibrium solutions for this differential equation.

(see next page)
b. Sketch the graph of $f(y)$ in the $y - f$ plane.

c. Draw the phase line diagram. Indicate if equilibrium solutions are attracting, repelling or nodes.

d. Summarize the long term behavior of solutions of the differential equation in terms of their initial conditions. Phrase your answers in the form “if the initial condition $y_0$ is in a certain region then $\lim_{t \to \infty} y(t) = \ldots$.”

Self evaluation: (Circle) Rate your level of understanding of the material on the quiz:

Mastery         Developing        Not Yet