Quiz 3, Math 246, Professor David Levermore
Tuesday, 17 September 2019

Your Name:

Discussion Instructor (circle one):   Sam Potter   Nathan Yu   David Russell
Discussion Time (circle one):   9:00   11:00   12:00

No books, notes, calculators, or any electronic devices.
Show your reasoning for full credit. Good luck!

(1) [4] Consider the solution $x(t)$ of the initial-value problem
$$\ddot{x} = -2x^3, \qquad x(0) = 2, \quad \dot{x}(0) = -3.$$
Find the reduced equation satisfied by $x(t)$.

(2) [2] Suppose we have used the Runge-Kutta method to approximate the solution of an initial-value problem over the time interval $[3, 13]$ with 1000 uniform time steps. About how many uniform time steps do we need to reduce the global error of our approximation by a factor of $\frac{1}{625}$?

(3) [4] Consider the initial-value problem
$$\frac{dv}{dt} = 3v - v^2, \qquad v(0) = 2.$$
Approximate $v(.2)$ using one step of the Runge-trapezoidal method.
Leave your answer as an arithmetic expression.