

Show all work. You may leave arithmetic expressions in any form that a calculator could evaluate. By putting your name on this paper, you agree to abide by the university's code of academic integrity in completing the quiz. Use no books, calculators, cellphones, other electronic devices, communication with others, scratchpaper, etc.

Name _____

1. (10) Let $i = \sqrt{-1}$, and suppose we have a system of differential equations $\mathbf{y}' = \mathbf{y}(t, \mathbf{y})$ with 3 components. Suppose the system has a Jacobian matrix $\mathbf{J}(t, \mathbf{y})$ with eigenvalues

$$\begin{aligned} &4 - t^2, \\ &-t - it, \\ &-t + it. \end{aligned}$$

For what values of t is the equation stable?

2. Let

$$\begin{aligned}y' &= 10y^2 - 20, \\y(0) &= 1.\end{aligned}$$

Apply a PECE scheme to this problem, using Euler and Backward Euler with a stepsize $h = .1$, to obtain an approximation for $y(.1)$.