# Math 4329, Test III

Name _____

1. Use the power method to find the largest (in absolute value) eigenvalue of

$$\begin{bmatrix} 1 & 1 & 0 \\ 1 & 10 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

Start with $(1, 5, 1)$ and do 3 iterations. What is the corresponding eigenvector?

2.     a. Write the third order differential equation $u''' - 3u'' - u = t^2$ as a system of three first order equations, that is, in the form:

$u' = f(t, u, v, w) =$

$v' = g(t, u, v, w) =$

$w' = h(t, u, v, w) =$

    b. Now write out the formulas for $u_{n+1}, v_{n+1}, w_{n+1}$ for Euler's method applied to this system of first order equations:

$u_{n+1} =$

$v_{n+1} =$

$w_{n+1} =$

3. If the third order Taylor series method (two more terms than Euler's method) is used to solve $u' = t^2 + 5u$, write $u_{n+1}$ in terms of $h, t_n$ and $u_n$ only. $(t_n = nh, u_n \approx u(t_n))$

4. Do **one** iteration of Newton's method, starting from $(0,0)$, to solve:

$f(x, y) = \sqrt{2x + 1} + xy + 3 = 0$
$g(x, y) = sin(3x + 2y) - ln(1 + x) = 0$