

Sp2016 Practice Final: 8 questions - 12 or 13 points each - 100 points total.

Name _____

Show matrices etc. you enter in calculators and explain what you did.

No points for dsolve.

No imaginary numbers in final answers.

Read the instructions.

Use the back of a page to show more work if you need to.

Notes:

If I give you the eigenvalues and eigenvectors of a matrix use them.

If I give you solutions to part of the problem use them.

I may try to save you time by asking you just to show me a matrix that you would row reduce.

Total	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8

1. Solve the Initial Value Problem $X' = \begin{pmatrix} 11 & -4 & 2 \\ 20 & -7 & 6 \\ 8 & -4 & 5 \end{pmatrix} X + \begin{pmatrix} 12e^t \\ 0 \\ \cos(2t) \end{pmatrix}$

Write down the matrix you would row reduce to satisfy $X[0] = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$.

2. Solve the Initial Value Problem $X' = \begin{pmatrix} 6 & -32 & -4 \\ 0 & -4 & 0 \\ 1 & -16 & 2 \end{pmatrix} \cdot X + e^{3t} \begin{pmatrix} 1 \\ 0 \\ 9 \end{pmatrix}$

satisfying $X[0] = \begin{pmatrix} 8 \\ 6 \\ 4 \end{pmatrix}$.

Score

3. Solve the Ordinary Differential Equation

$$X' = \begin{pmatrix} -8 & 22 & 0 \\ 0 & 3 & 0 \\ 22 & -44 & 3 \end{pmatrix} X + \begin{pmatrix} 1 \\ 2t \\ 3 \end{pmatrix}$$

Write down the matrix you would row reduce to satisfy $X[0] = \begin{pmatrix} 3 \\ 2 \\ 1 \end{pmatrix}$.

Score

4. Solve $\frac{dQ}{dt} = e^{Q-2t}$

$Q(3)=4$

Score

5. Solve $\frac{dy}{dx} = y - x^3$ $y(2)=3$

Score

6. Solve $(1 + 2e^{x+2y})y' = -(e^{x+2y} + 3x^2)$ $y(1) = 4$

Score

7. Solve $y' - \cos(x)y = 2 \cos(x)$ $y(\pi/2) = 1$

Score

8. Solve

$$\left(2y + \frac{1}{1+(x+y)^2}\right) \frac{dy}{dx} = -\left(\frac{1}{1+(x+y)^2} + \cos(x)\right) \quad y(1) = 3$$

Score

9. Use Euler method to obtain a 4 decimal approximation of $y(-0.8)$ for $y' = 2y + e^{-x}$ with $y(-1) = 0.2$.
First use $h = 0.1$ and then $h = 0.05$. Find an explicit solution for the initial value problem and fill in the tables.

Score

$$\text{Out}[35]= -0.333333 e^{-x} + 8.17299 e^{2x}$$

Out[38]//TableForm=

	X_n	y_n	Actual Value	Abs. Error	%Relative Error
1	-1	0.2	0.3	0.	0.
2	-0.9	0.511828	0.531118	0.0192903	3.63202
3	-0.8	0.860154	0.908251	0.0480972	5.29558

Out[41]//TableForm=

	X_n	y_n	Actual Value	Abs. Error	%Relative Error
1	-1	0.2	0.3	0.	0.
2	-0.95	0.355914	0.36052	0.00460555	1.27747
3	-0.9	0.520791	0.531118	0.0103275	1.94448
4	-0.85	0.69585	0.713188	0.0173381	2.43107
5	-0.8	0.882418	0.908251	0.0258337	2.84433

10. Solve $y''' + 5y'' + 22y' + 48y = x$

Score

11. Solve $y'' - 9y = \cos(2t) + e^{3t}$

Score

12. Solve $4y''[x] + y[x] = \text{Sec}[x/2]$

Score
