MATH:3600:0002 Final Exam
Dec. 12, 2016

SHOW ALL STEPS

[6] 1.) The Wronskian of $e^{-t}cos(t)$, $e^{-t}sin(t)$ is $W(e^{-t}cos(t), e^{-t}sin(t)) =$ ______________________

[14] 2.) Solve $t\frac{dy}{dt} + y = 8t^2$

Answer: ____

[14] 3.) Solve $(3x^4 + 2y)dx + (2x + 4y^3)dy = 0$

Answer: ______________________________

[18] 4.) Solve $y''' - 4y' = 30e^{3t} + 8t$, $y(0) = 0$, $y'(0) = 6$, $y''(0) = 16$.

Answer: ____

[10] 5a.) Solve $\mathbf{x}' = \begin{pmatrix} 4 & 5 \\ 4 & 3 \end{pmatrix} \mathbf{x}$

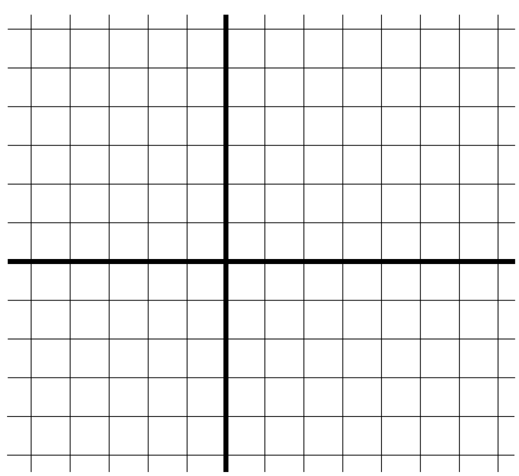
Answer: ______________________________

[4] 5b.) Find all equilibrium solutions and determine whether the critical point is asymptotically stable, stable, or unstable. Also classify it as to type (nodal source, nodal sink, saddle point, spiral source, spiral sink, center).

Equilibrium solution: ______________________

Stability : ______________________ Type: ______________________

[4] 5c.) Plot a phase portrait for this system



[10] 6.) Given the recursive relation $a_n = \frac{4a_{n-1}}{(n+1)n}$ where $a_0 = 1$,

use induction to prove that $a_n = \frac{4^n}{(n+1)!n!}$.

7.) Given the differential equation: $xy'' + 4y = 0$

[3] 7a.) Show that $x = 0$ is a regular singular point of the above differential equation.

[4] 7b.) The indicial equation is ______________________

[1] 7c.) The roots are the indicial equation are ______________________

[5] 7d.) After plugging in the larger root, the recurrence relation is ______________________

[3] 7e.) For the larger root, if $a_0 = 1$, then $a_1 =$ ________, $a_2 =$ ________, $a_3 =$ ________.

[4] 7f.) Use your answer to 5e to give an approximation of one solution to the above differential equation.

Answer for 7f: ____