MATH 319 - SEC 003, SPRING 2014. HOMEWORK 4

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Due : Monday, February 24.

Please show all your work and/or justify your answers.

Section 2.6: Determine whether each of the equations in Problems 1 through 1-4 is exact. If it is exact, find the solution

1. $(2x+3)+(2y-2)y'=0.$

2. $(2x+4y)+(2x-2y)y'=0.$

3. $(3x^2-2xy+2)dx+(6y^2-x^2+3)dy=0.$

4. $(2xy^2+2y)+(2x^2y+2x)y'=0.$

Section 2.6 Problem 13 Solve the given initial value problem and determine at least approximately where the solution is valid.

$$(2x-y)dx+(2y-x)dy=0,\ y(1)=3.$$

Section 2.6 Problem 20 Show that the given equation is not exact but becomes exact when multiplied by a given integrating factor. Then solve the equation.

$$\left(\frac{\sin y}{y}-2e^{-x}\sin x\right)dx+\left(\frac{\cos y+2e^{-x}\cos x}{y}\right)dy=0,\ \mu(x,y)=ye^{x}.$$

Section 2.6 Problem 25 Find an integrating factor and solve the given equation

$$(3x^2y+2xy+y^3)dx+(x^2+y^2)dy=0$$

Section 2.7 Problem 3 Consider the following initial value problem

$$y'=0.5-t+2y,\ y(0)=1.$$

(a) Find approximate values of the solution at $t=0.1,0.2,0.3$ and 0.4 using the Euler's method with $h=0.1$.

(b) Repeat part (a) with $h=0.05$. Compare the results with those found in (a)

(c) Repeat part (a) with $h=0.025$. Compare the results with theses fond in (a) and (b).

(d) FInd the solution $y=\phi(t)$ of the given problem and evaluate $\phi(t)$ at $t=0.1,0.2,0.3$ and 0.4. Compare these values with the results of (a), (b) and (c).

Section 3.1 In each of the problems 9 through 11 find the solution of the given initial value problem. Sketch the graph of the solution and describe its behavior as t increases

9. $y''+y'-2y=0,\ y(0)=1,\ y'(0)=1.$

10. $y''+4y'+3y=0,\ y(0)=2,\ y'(0)=-1$

11. $6y''-5y'+y=0,\ y(0)=4,\ y'(0)=0$

Section 3.1 Problem 17 Find a differential equation whose general solution is $y=c_1e^{2t}+c_2e^{-3t}$

Section 3.1 Problem 21 Solve the initial value problem $y''-y'-2y=0, y(0)=\alpha, y'(0)=2.$ Then find α so that the solution approaches zero as $t\to\infty$.

Section 3.2 Compute the Wronskian of the following pair of functions and determine if they are linearly independent or linearly dependent on the real line:

$$f(x) = \sin^2 x, g(x) = 1 - \cos(2x)$$