MTH 291, Quiz #1, Fall 2017 Name KEY

Instructions: Show all work. Use exact answers unless specifically asked to round.

1. Use the method of Separation of Variables to solve the differential equation $x^2\frac{dy}{dx} = y - yx$, $y(-1) = -1$.

$x^2\frac{dy}{dx} = y(1-x)$

$\frac{dy}{y} = \frac{1-x}{x^2}dx$

$\int\frac{dy}{y} = \int\frac{1}{x^2} - \frac{1}{x}dx$

$\ln y = -\frac{1}{x} - \ln x + C$

$y = e^{-\frac{1}{x}} \cdot e^{-\ln x} e^C = Ae^{-1/x}e^{1/x} = Ae^{2/x}$

$-1 = Ae^{2/-1} \rightarrow$

$-1 = Ae^{-2} \rightarrow A = -e^2$

$y = -e^2e^{2/x} = -e^{2/x+2}$

2. Describe the procedure for determining if a first order differential equation is homogeneous.

replace x w/ tx & y w/ ty if t factors out & cancels, it's homogeneous

3. Use Euler's Method to estimate the value of the solution at $t = 1$, $y' = ty + \sqrt{y}$, $y(0) = 1$, using $\Delta t = 0.25$. Carry at least 5 places through your calculation, and round your final answer to 4 decimal places.

t_n	y_n	m_n	y_{n+1}
0	1	1	$1(.25)+1 = 1.25$
.25	1.25	1.43	$1.43(.25)+1.25 = 1.6076$
.5	1.6076	2.0717	$2.07(.25)+1.6076 = 2.12557$
.75	2.1256	3.052	$3.052(.25)+2.12557 = 2.888596347$
1.0	2.8886		