MEMORIAL UNIVERSITY OF NEWFOUNDLAND
DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 3 $\qquad$ **MATH 2260** $\qquad$ SPRING 2019

Due: Wednesday, June 5th, 2019 at 1:00pm. SHOW ALL WORK.

1. Solve each of the following separable differential equations.

    (a) $\dfrac{\cos(t)}{y+2}\dfrac{dy}{dt} = \dfrac{y-3}{\csc(t)}$

    (b) $\dfrac{t}{1+y^2}\dfrac{dy}{dt} + \dfrac{t^2}{e^t} - \sqrt{t} = 0$

2. Consider the equation $(y-t)\dfrac{dy}{dt} = y+t$.

    (a) Show that this equation is homogeneous.

    (b) Solve the equation.

3. Solve the Bernoulli equation

$$\frac{dy}{dt} + 2\cos(t)y = 2\cos(t)\sqrt{y}.$$

4. Determine whether each of the following equations is exact. If it is exact, find the solution. Otherwise, construct an appropriate integrating factor to make it exact and then find the solution.

    (a) $\dfrac{y^4\csc(\sqrt{t})\cot(\sqrt{t})}{\sqrt{t}} - e^t - 8y^3\csc(\sqrt{t})\dfrac{dy}{dt} = 0$

    (b) $ty^2 - y + (t + 2y^3)\dfrac{dy}{dt} = 0$

    (c) $e^y\sin(t) + e^y\dfrac{dy}{dt} = 0$

5. Use an appropriate method studied in class to solve each of the following initial value problems.

    (a) $t\dfrac{dy}{dt} - y = t\sec\left(\dfrac{y}{t}\right), \quad y(1) = \frac{\pi}{6}$

    (b) $ye^{ty} + 1 - (1 - te^{ty})\dfrac{dy}{dt} = 0, \quad y(0) = 5$