Differential Equations **Homework 4** **Name:**

MWF 10-10:50 or MWF 11-11:50

Show your work! Answers without supporting work will not be given credit. Print this assignment and write your work in the spaces provided.

1. Consider the ode $y' = \dfrac{(3x^2 - e^x)}{(2y - 5)}$, $y(0) = 1$.

   (a) Determine whether this equation is Exact or Separable?

   (b) What is the standard form?

   (c) What is the general solution?

   (d) What is the explicit IVP solution?

   (e) What is/are the singular solution/s?

   (f) What is the domain of the solution?

2. Consider $y^2(1-x^2)^{\frac{1}{2}}dy = \arcsin(x)dx$, $y(0) = 1$. [1]

(a) Determine whether this equation is Exact or Separable?

(b) What is the standard form?

(c) What is the general solution?

(d) What is the explicit IVP solution?

(e) What is/are the singular solution/s?

(f) What is the domain of the solution?

[1] To solve this remember $\frac{d}{dx}\left(\arcsin(x)\right) = \frac{1}{\sqrt{1-x^2}}$ and you will need a u-substitution.

3. Solve $\dfrac{x\,dx}{(x^2+y^2)^{\frac{1}{2}}} + \dfrac{y\,dy}{(x^2+y^2)^{\frac{1}{2}}} = 0,\ \ y(1) = 2,\ \ x > 0$ using the **Exact** equation method.[2]

4. Consider the equation $\dfrac{dy}{dx} + \dfrac{2y^2 + 6xy - 4}{3x^2 + 4xy + 3y^2} = 0,\ y(0) = 1.$

   (a) Determine whether this equation is Exact or Separable?

   (b) What is the standard form?

   (c) What is the general solution?

[2]This is also a separable equation but points are given only to exact method solutions.

5. Solve the first order homogeneous equation $\frac{dy}{dx} = \frac{x^2 + 3y^2}{2xy}$, $x > 0$.

6. Solve the first order homogeneous equation $(x^2 + 3xy + y^2)dx - x^2 dy = 0$, $x > 0$.

7. Solve the Bernoulli equation: $t^2 y' + 2ty - y^3 = 0$, $t > 0$.

8. Solve the first order homogeneous equation $xy' = y + xe^{y/x}$, $x > 0$. [3]

[3] This is more challenging than what we have done so far. Remember $e^{y/x}$ is already in the form e^v. Take care of the other variable by factoring/dividing by x. Observe $y' = f(v)$, then do the substitution.