Math 2280 HOMEWORK #4 Name:

Due 1/31/2025, 8:30 A.M.

Solve the following problems and staple your solutions to this cover sheet. (Computer outputs must be put in the appropriate place in the solution, not attached as an appendix. You may physically cut and paste the output in the problem or allow appropriate space in the printout to add your hand written work.)

1. Find the general solution of $y'' + 2\,x^{-1}y' = 0$. Hints: Let $u = y'$. Then $y'' = u'$. See your class notes. You will see this problem again in a later homework!

2. Find the general solution of $t\,v'' + (t-1)v' = 0$. Assume $t > 0$. Hints: Let $u = v'$. Then $v'' = u'$. This problem, in different variables, is solved in class notes! You will see this problem again in a later homework.

3. Sec 2.3 #10

4. Sec 2.3 #17

5. Sec 2.3 #25(a) Hint: $\frac{d}{dx}[\int_2^x e^{t^2}\,dt] = e^{x^2}$.

6. Sec 2.4 #12

7. Sec 2.4 #22

8. Solve $\frac{dy}{dx} = \frac{2x-2xy}{1+x^2}$ using the technique associated with each of the three types of the equations this ODE belongs to: (a) First order linear equation, (b) Separable equation, and (c) Exact equation. Note: Obviously, you should get three equivalent, if not exactly the same, answers. Show this!

9. Show that $\mu(x,\,y) = \frac{1}{xy(2x+y)}$ is an integrating factor of the equation $(3xy+y^2)+(x^2+xy)\,\frac{dy}{dx} = 0$.

10. Sec 2.5 #8

11. Sec 2.5 #11

12. Identify the equation $(x^2\,\sin x + 4y)\,dx + x\,dy = 0$ as separable, linear, exact, or that can be made exact using an integrating factor that is a function of either $x$ alone or $y$ alone. State all that apply.