Math 2552 - Differential Equations **Exam 1 Review Problems**
Sections F1 – F4; L1 – L4
Georgia Institute of Technology, Fall 2015

Solve the ODEs below. If they are IVPs, give the largest interval where your solution is valid.

1. $y\dfrac{dy}{dx} = (x + xy^2)e^{x^2}$.

2. $\left(x^2 + \dfrac{2y}{x}\right)\,dx = (3 - \ln x^2)\,dy$.

3. $\dfrac{dy}{dx} = \dfrac{x}{y} + \dfrac{y}{x} + 1$.

4. $2xyy' + y^2 = 2x^2$.

5. $\dfrac{y}{x^2}\dfrac{dy}{dx} + e^{2x^3+y^2} = 0$.

6. $xyy' + y^2 = 2x$.

7. $y\,dx + x\,dy = 0$.

8. $\dfrac{dy}{dx} = \dfrac{1}{y - x}$.

9. $e^{x+y}\,dy - dx = 0$.

10. $(x^2 - 1)\dfrac{dy}{dx} + 2y = (x + 1)^2$.

11. $\dfrac{dy}{dx} = \dfrac{y - x}{y + x}$.

12. $x\,dy = y \ln y\,dx;\ y(2) = e$.

13. $\left(1 + \ln x + \dfrac{y}{x}\right)\,dx = (1 - \ln x)\,dy$.

14. $xy' + y = e^x;\ y(1) = 2$.

15. $dy - \sin x(y + 2)\,dx = 0;\ y(\pi/2) = 1$.

16. $\dfrac{dy}{dx} = \dfrac{xy + 3x - y - 3}{xy - 2x + 4y - 8}$.

17. $y\left(\ln\left(\dfrac{y}{x}\right) + 1\right)\,dx - x\,dy = 0$.

18. $\dfrac{dy}{dx} = \dfrac{2\ln x}{xy}$

19. $\dfrac{dy}{dx} + \dfrac{1}{x}y = \dfrac{25x^2 \ln x}{2y}$.

20. $\dfrac{dy}{dx} + \dfrac{2e^{2x}}{1 + e^{2x}}y = \dfrac{1}{e^{2x} - 1}$.

21. $\dfrac{dy}{dx} = \dfrac{\sin y + y\cos x + 1}{1 - x\cos y - \sin x}$.

22. $(\ln(xy) + 1)\,dx + \left(\dfrac{x}{y} + 2y\right)\,dy = 0$.

23. $\dfrac{dy}{dx} - x^2 y = \sqrt{y}x^2$.

24. $2x(\ln x)y' - y = -9x^3y^3 \ln x$.

25. $e^{2x+y}\,dy - e^{x-y}\,dx = 0$.

26. $y' + y\sin x = \sin x$.

27. $y' + y(\tan x + y\sin x) = 0$.

28. $\dfrac{dy}{dx} = \dfrac{x^2}{x^2 - y^2} + \dfrac{y}{x}$.

29. $(3x^2 + 2xy^2)\,dx + (2x^2y)\,dy = 0$.

30. $xy' - 2y = 2x^2 \ln x$.

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

32. $y' - x^{-1}y = x^{-1}\sqrt{x^2 - y^2}; x > 0$.

33. $(1 + x)y' = y(2 + x)$.

34. $(y - e^x)\,dx + \,dy = 0$.