

## Differential Equations

### Homework 4

Due Feb. 12, 2024, 4:00 pm (Monday)

**Note:**

- Please show all of your work (writing a list of answers is not sufficient).
- Please indicate the people you worked with.
- **Please staple your HW.**
- Several random problems will be graded (1 point each).

1. Find the general solution of

$$x^2y' + 2xy = 5y^3$$

2. Find the general solution of

$$x^2y' + 2xy = 5y^4$$

3. Find the general solution of

$$xy' + 6y = 3xy^{4/3}$$

4. Verify that the given differential equation is exact; then solve it

$$(4x - y) + (6y - x)\frac{dy}{dx} = 0$$

5. Verify that the given differential equation is exact; then solve it

$$(x^3 + \frac{y}{x}) + (y^2 + \ln x)y' = 0$$

6. Verify that the given differential equation is exact; then solve it

$$(1 + ye^{xy})dx + (2y + xe^{xy})dy = 0$$

7. Verify that the given differential equation is exact; then solve it

$$(\cos x + \ln y)dx + (\frac{x}{y} + e^y)dy = 0$$

8. Show that the substitution  $v = \ln y$  transforms

$$\frac{dy}{dx} + P(x)y = Q(x)(y \ln y)$$

into the linear differential equation

$$\frac{dv}{dx} + P(x) = Q(x)v(x).$$