

Complete the following questions on a separate piece of paper. Show all work.
Do not use your notes unless absolutely necessary. If you use your notes please indicate
where.
Questions will be gone over at tutoring sessions. Please be prepared.

Worksheet 3

Section 2.1 and 2.2

1. Find the general solution using the integrating factor method.

(a) $\frac{dy}{dx} + 2y = 3e^x$ for $x \in (-\infty, \infty)$

(b) $\cos(x) \cdot \frac{dy}{dx} + \sin(x) \cdot y = 1$ in the interval $(-\frac{\pi}{2}, \frac{\pi}{2})$

(c) $\frac{dy}{dx} - y = e^{3x}$

(d) $\frac{dy}{dx} - \frac{2y}{x} = x^2 \cos(x)$

(e) $(x^2 + 9)\frac{dy}{dx} + xy = 0$

2. Solve the following IVP's. State the general and particular solution.

(a)
$$\begin{cases} xy' - 2y = -x^2 \\ y(1) = 0 \end{cases}$$

(b)
$$\begin{cases} \frac{dy}{dx} - y = 1 \\ y(0) = 1 \end{cases}$$

(c)
$$\begin{cases} \frac{dy}{dx} - \frac{3}{x}y = x^3 \\ y(1) = 4 \end{cases}$$

3. Which of the following equations are separable. Why?

(a) $\frac{dy}{dx} = e^{x+y}$

(b) $\frac{dy}{dx} = \frac{y+1}{xy} + y$

(c) $x\frac{dy}{dx} = 1 + y^2$

(d) $\frac{dy}{dx} = x + y$

4. Solve the following DE's.

(a) $\frac{dy}{dx} = y$

$$(b) \frac{dy}{dx} = \frac{2x(y+1)}{y}$$

$$(c) \frac{dy}{dx} = x^2y$$

$$(d) \frac{dy}{dx} = \frac{y \sin(x)}{1 - \cos(x)}$$

5. Solve the following IVP's

$$(a) \begin{cases} \frac{dy}{dx} = \frac{y^2 - 5y + 6}{x} \\ y(1) = 1 \end{cases}$$

$$(b) \begin{cases} \frac{dy}{dx} = -\frac{x}{y} \\ y(0) = 1 \end{cases}$$

$$(c) \begin{cases} x \frac{dy}{dx} - y = 2x^2y \\ y(1) = e \end{cases}$$

$$(d) \begin{cases} \frac{dy}{dx} = y^2 - 4 \\ y(0) = -6 \end{cases}$$