1. For each of this problem, write down the Maple commands to solve the given equations. The answer to part 1a is given below; you must do the others.

(a) \[ x^2 y' + xy - y^2 = 0 \]
\[ > ode := x^2 \* diff(y(x), x) + x \* y(x) - y(x)^2 = 0 \]
\[ > dsolve(ode, y(x)) \]

(b) \[ y' = \frac{xy + y^2}{x^2} \]

(c) \[ y'' + y = x^2 + 2 \]

(d) \[ y'' + 4y = 5e^{-x} \]

2. In each of this problem write down the Maple commands to solve the given initial-value problems. The answer to part 1a is given below; you must do the others.

(a) \[ x^2 y' + xy - y^2 = 0, \text{ subject to } y(1) = \frac{1}{3} \]
\[ > dsolve(\{ode, y(1) = 1/3\}, y(x)) \]

(b) \[ y' = \frac{xy + y^2}{x^2}, \text{ subject to } y(1) = \frac{2}{3} \]

(c) \[ y' - ty = \sin^2 t, \text{ subject to } y(\pi) = 5 \]

3. In each of this problem do the following:
(a) Find $y(3)$ and plot $y(x)$ for $1 \leq x \leq 2$ if $y(x)$ is the solution of the initial value problem $x^2y' + xy - y^2 = 0$, subject to $y(1) = \frac{1}{3}$.

(b) Show that $y^2 + x - 3 = 0$ is an implicit solution to $y' = -\frac{1}{xy}$.

(c) Show that $\phi(x) = x^2$ is an explicit solution to $xy' = 2y$.

(d) Determine whether the function $x = 2\cos t - 3\sin t$ is a solution to the differential equation $x'' + x = 0$.

4. Plot the direction field for $y' = 2x + y$. Also sketch the solution curves pass through $(0, -2)$ and $(-1, 3)$ respectively. Don’t forget to Put title, color, and label on the graph.

5. Draw the direction field for the following differential equations. Sketch some of the solution curves:

(a) $y' = \sin x$

(b) $y' = x^2 - 2y^2$.

(c) $y' = y - x$.

(d) $y' = \frac{-y}{x}$.

Best of Luck!