EDDE. PROBLEM SET 2

1. Solve the differential equations:

   a) $y' = x^2 y$

   b) $xy' + 2y = 1$

   c) $(x^2 - 1)y' = y$

   d) $(x^2 + 1)y' + y^2 + 1 = 0$

   e) $y^2 y' = 1 - 2x$

   f) $\sin y \cos x \cdot y' = \sin x \cos y$.

2. Find the general solutions to the following differential equations:

$$\frac{dy}{dx} = \frac{y}{x} \text{ and } \frac{dy}{dx} = -\frac{x}{y}.$$

   Draw the graphs of those solutions and interpret what you see.

3. Repeat the above for the pair:

$$\frac{dy}{dx} = \frac{x}{y} \text{ and } \frac{dy}{dx} = -\frac{y}{x}.$$

4. Find the family of curves orthogonal (i.e. perpendicular) to all the parabolas $y = ax^2$.