

## Week 2

Exercises marked (\*) are harder and would not appear on quizzes. But variations of them may appear on the midterm. Exercises marked (\*\*) are above the required level. Most of the exercises are in the main textbook.

- Check whether the following equations are exact or not. If they are exact, provide the implicit solution.

1.  $(2x+3)dx + (2y-2)dy = 0$ ,
2.  $(2x+4y)dx + (2x-2y)dy = 0$ ,
3.  $(y/x + 6x)dx + (\ln(x) - 2)dy = 0$ ,
4.  $\frac{x}{(x^2+y^2)^{3/2}}dx + \frac{y}{(x^2+y^2)^{3/2}}dy = 0$ .

- The following equations are not exact, but they satisfy a ratio condition i.e.  $\frac{N_x - M_y}{M}$  depends only on y or  $\frac{M_y - N_x}{N}$  depends only on x. Use the integrating factor approach to make them exact and determine the implicit solution.

1.  $(3x^2y + 2xy + y^3)dx + (x^2 + y^2)dy = 0$ ,
2.  $y' = e^{2x} + y - 1$ ,
3.  $y + (2xy - e^{-2y})y' = 0$ .

- (\*) Find the perpendicular trajectories to the curves:

1.  $y = e^{k \cdot x}$ ,
2.  $y^2 = k \cdot x$ .