Math 33b, Winter 2013, Tonći Antunović - Homework 2

From the textbook solve the problems:

Section 2.5: 2, 4, 8, 12

Section 2.6: 2, 6, 10, 14, 18, 22, 24, 26, 28

And also the problems below:

Problem 1. A 10 gallon tank contains salt-water of concentration 1 gram per gallon. Water is pumped out of the tank at the rate of 0.1 gallon per second and sent through a filter and then back to the tank. The filter reduces the concentration in the water that goes through it: the salt concentration in the water coming out of the filter is half of the salt concentration of the water coming into the filter. Find the concentration of the salt in the tank after t seconds.

Problem 2. Show that the differential equation

$$4x^3y^3\ dx + 3x^4y^2\ dy = 0$$

is exact. Find the general solution.

Problem 3. Solve the initial problem

$$x^3\ dx + y\ dy = 0, \quad y(0) = 1.$$

Problem 4. Explain how to find an integrating factor for the equation

$$(y - f(x))\ dx + g(x)\ dy = 0,$$

where f and g are differentiable functions.