Homework 3

Check if the following equations are exact; if they are, then solve them using the method of solving exact equations.

1.
$$\frac{x}{\sqrt{x^2+y^2}}dx + \frac{y}{\sqrt{x^2+y^2}}dy = 0.$$

2.
$$(\cos x \sin x - xy^2)dx + y(1-x^2)dy = 0.$$

3.
$$(2xydx + (x^2-1)dy = 0.$$

4.
$$(x^2-y^2)dx + (x^2-2xy)dy = 0.$$

5.
$$(y\ln y - e^{-xy})dx + \left(\frac{1}{y} + x\ln y\right)dy = 0.$$

Solve the initial value problems

6.
$$(x+y)^2dx + (2xy+x^2-1)dy = 0, \quad y(1) = 1.$$

7.
$$y' = \frac{-2x-y}{x-1}, \quad y(0) = 1.$$

8.
$$\left(1 + 2x\sqrt{x^2-y^2}\right)dx - 2y\sqrt{x^2-y^2}dy = 0, \quad y(1) = 1.$$