

Differential equations I

Final exam 13.5.2008

No calculators or cell-phones, MAOL-tables are allowed

1. Solve the initial value problem $y' = (y^2 + 1)/y^2$, $y(1) = 1$ in the implicit form.

2. Show that the equation

$$2y + (x + y) y' = 0$$

has an integrating factor of the form $\mu(y)$ i.e. a function of y alone. Determine μ and solve the resulting exact equation. Does this give all solutions of the original equation?

3. Solve the initial value problem

$$xy' + 2y = \cos^2(x) - \sin^2(x), \quad y(\pi/2) = 0.$$

4. Determine the general solution of the equation $y' - y = e^{2x}y^3$.
5. Solve the initial value problem $y'' - 6y' + 9y = 0$, $y(0) = 0, y'(0) = -1$.