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Differential Equations (MTH4102) Problem Sheet 3

Problem 7

Solve each of the following differential equations by separation of variables. Whenever possible write the general solution in explicit form. Fix for each solution the constant of integration according to the given initial condition.

- a) $y' = -x/y$, $y(0) = -2$
- b) $y' = (y^2 + 1)/y$, $y(0) = 1$
- c) $y' = (1 + y^2)e^x$, $y(0) = -1$
- d) $y' = ye^x - 2e^x + y - 2$, $y(0) = 0$
- e) $y' = xy/(x - 1)$, $y(0) = 2$

Problem 8

Consider the differential equation

$$y' = -y/x - x/y.$$

- a) Use the substitution $y(x) = xz(x)$ to rewrite the differential equation in terms of the new dependent variable z .
- b) Solve the differential equation for z by separation of variables and determine the general solution $y(x)$ of the original differential equation.

Problem 9

Compute the general solution in implicit form of the differential equation

$$y' = x^4 - (xy)^4$$

using separation of variables.

For the homework please turn over

Problem C Homework

a) Solve the initial value problem

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

by separation of variables.

b) Determine the general solution to the differential equation

$$y' = \frac{y}{x^2 + 4x + 5}$$

Fix the constant of integration according to the initial condition $y(-1) = 1$.

c) Find the general solution of the differential equation

$$y' = \frac{2x^2 + y^2}{xy}.$$

in explicit form.

**Homework, and homework only, to be handed in during week 4 tutorials, Wed/Thurs
3/4 Feb 2010**