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Worksheet 3
Advanced Mathematics II for Mechanical Engineering

Problem 11: Solve the following initial value problems:

a) $y' = \frac{1}{1-x}y + x - 1, \quad x > 1, \quad y(2) = 0$ b) $y' = \sin(x + y + 1), \quad y(0) = 0$
 c) $y^3 - x^2 + xy^2y' = 0, \quad y(1) = 1$ d) $y' = \sqrt{1 - y^2}, \quad y(0) = 1$

Hint for b): Use the substitution $z = x + y + 1$.

Problem 12: Determine a solution of the following initial value problems:

a) $y'(x) + xy^3(x) + 2y(x) = 0, \quad y(0) = 1,$
 b) $x^2(y'(x) + y^2(x)) = xy(x) - 1, \quad x > 0, \quad y(1) = 2.$

Hint for b): Substitute $xy(x)$ with $u(x)$.

Problem 13: What is the solution of

$$y'(x) + y(x) - y^3(x) = 0, \quad y(0) = \frac{1}{2}?$$

Problem 14: Compute the antiderivative

$$\int \frac{3u^3 + u - 2}{1 + 5u^2 + 4u^4} du.$$

Problem 15: Using an appropriate substitution, determine the antiderivative

$$\int \frac{e^x - 1}{e^{2x} + 2e^x - 1} dx.$$

Due date: Monday, May 09, 2005, 1:00 pm (in the slots outside room 208.1 of the mathematics building)