



ÇANKAYA UNIVERSITY  
Department of Mathematics

**MATH 254 - Introduction to Differential Equations**

**1. MIDTERM EXAMINATION**  
**18.11.2021**

**STUDENT NUMBER:**

**NAME-SURNAME:**

**SIGNATURE:**

**INSTRUCTOR:**

**DURATION:** 100 minutes

Question	Grade	Out of
1		20
2		20
3		20
4		20
5		20
Total		100

**IMPORTANT NOTES:**

- 1) Please make sure that you have written your student number and name above.
- 2) Check that the exam paper contains 5 problems.
- 3) Show all your work. No points will be given to correct answers without reasonable work.

- 1) Solve the equation  $y' \sin x = y^2 - y \cos x - \sin^2 x$  (Hint: you may search for a particular solution as  $y = a \cos x + b \sin x$ , where  $a, b$  are some constants).

2) Solve the equation  $\left[ \frac{\sin(x+y)}{x} + \cos(x+y) \right] dx + \left[ \frac{\sin(x+y)}{y} + \cos(x+y) \right] dy = 0$ .

**3)** Solve the equation  $\frac{dy}{dx} - \frac{1}{2\sqrt{1+x^2}}y = \frac{1}{\sqrt{1+x^2}}y^3$ .

4) Solve the equation  $\frac{dy}{dx} = \cos^2\left(\frac{x+y}{2}\right) - \sin^2\left(\frac{x+y}{2}\right)$ .

5) Solve the initial-value problem  $\frac{dx}{dy} = \frac{x - y - 2}{x + y}, y(2) = 0$ .