## MATHEMATICS 300 - MIDTERM EXAMINATION

<u>Date</u>: October 14, 2009 <u>Time</u>: 50 Minutes <u>Instructors</u>: Professor G. E. Swaters, Dr. H. Wang

GIVEN NAMES: \_\_\_\_\_

ID Number: \_\_\_\_\_

## **INSTRUCTIONS:**

- Answer all questions
- Unsubstantiated work may not receive full credit
- No aids are permitted
- 1. Use the  $Method \ of \ Characteristics$  to solve

$$u_t + \frac{2t}{1+t^2}u_x = -3t^2, \ -\infty < x < \infty, \ t > 0,$$
$$u(x,0) = \tanh(x), -\infty < x < \infty.$$

2. Compute the Fourier Series for

$$f(x) = 1 - |x|$$
, for  $-1 \le x \le 1$ .

3. Using Separation of Variables, solve the initial-boundary-value problem

$$\begin{split} u_{tt} - u_{xx} &= 0, \, 0 < x < 1, \, t > 0, \\ u\left(0,t\right) &= u_x\left(1,t\right) = 0, \, t > 0, \\ u\left(x,0\right) &= \sin\left(\pi x/2\right) \, \text{and} \, \, u_t\left(x,0\right) = \sin\left(3\pi x/2\right), \, 0 < x < 1. \end{split}$$