MATH 4335 Exam 1 Name_____
September 25, 2009

1. Find a "heat kernel" formula for the solution to the problem:

$u_t - ku_{xx} + bu = 0, \ -\infty < x < \infty, \ 0 < t < \infty$

$u(x,0) = \phi(x) \ -\infty < x < \infty$

The formula should look like:

$u(x,t) = \int_{-\infty}^{\infty} S(x-y,t)\phi(y)dy$. The problem is to find S.

Hint: What equation is solved by $v(x,t) = e^{bt}u(x,t)$*?*

2. Now find a "heat kernel" formula for the solution to the problem:

$u_t - ku_{xx} + bu = f(x,t), \ -\infty < x < \infty, \ 0 < t < \infty$

$u(x,0) = \phi(x) \ -\infty < x < \infty$

Be careful with f(x,t)!