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**ENGINEERING ANALYSIS**

**SUMMER 2015**

**HOMEWORK #3 PROBLEM 4**

Solve the boundary value problem on the wedge,

We will use separation of variables and let ; therefore, , , and Make the substitutions into the differential equation to get,

Notice in the first two terms we can factor out a ϕ and get,

Move terms to either side of the equality to get,

Divide out to get,

The far left side becomes,

So we have two implied differential equations:

Let us examine the first differential equation, it has characteristic equation,

Therefore, our solution for ϕ has the form,

The boundary conditions have the following implication: The first boundary condition yields . So our solution to ϕ will be of the form . If we use the second boundary condition we get,

This means,

So the corresponding functions are,

Let us now analyze the second differential equation,

If we let and we substitute we get,

Which simplifies to the following,

We can factor and divide out the common term and we are left with,

Therefore, we have the following solution,

But our solutions need to be bounded when r = 0, therefore, we will disregard the second term:

We have established the following,

A solution to our problem is,

Our general solution by the superposition principle is,

Therefore, by the definition of Fourier Series we can find a closed expression for ‘B’ coefficients when ,

Therefore,

Hence,

If we let we get,