ENGR 695 Advanced Topics in Engineering Mathematics Fall 2023

Selected Answers to HW #6

Include explanatory text and intermediate calculations in your solutions. You will not receive credit for merely repeating an answer given here without supporting work.

If an answer is not provided below, it is either because the solution is trivial or because disclosure of the answer would reveal too much of the solution.

It is possible that one or more answers are incorrect because of the rush to post them. If you suspect that an answer below is incorrect, please let me know as soon as possible.

1.
$$u(r,\theta,t)=\sum_{n=1}^{\infty}\sum_{i=1}^{\infty}J_n(\alpha_{ni}r)\left[A_n\cos(n\theta)\cos(a\alpha_{ni}t)+B_n\cos(n\theta)\sin(a\alpha_{ni}t)\right.$$
$$\left.+C_n\sin(n\theta)\cos(a\alpha_{ni}t)+D_n\sin(n\theta)\sin(a\alpha_{ni}t)\right]$$

where A_n, B_n, C_n, and D_n are constant coefficients. You do not have to find expressions for the coefficients.

2. $u(r,t)=\sum_{n=1}^{\infty}A_nJ_0(\alpha_n r)e^{-k\alpha_n^2 t}$ [expression for A_n not given]

3. a. The forward, backward, and centered first finite differences evaluate to −892.3, −871.2, and −897.7, respectively. The second finite difference evaluates to −21,165.
b. The forward, backward, and centered first finite differences evaluate to 0.6749, 0.7465, and 0.7080, respectively. The second finite difference evaluates to −0.7161.