CS 131 Problem 5

A pin fin is a slender extension attached to a surface in order to increase the surface area and enable greater heat transfer. When convection and radiation are included in the analysis, the steady-state temperature distribution, , along a pin fin can be calculated from the solution of the equation.

The Stefan-Boltzmann constant W/m2K4.

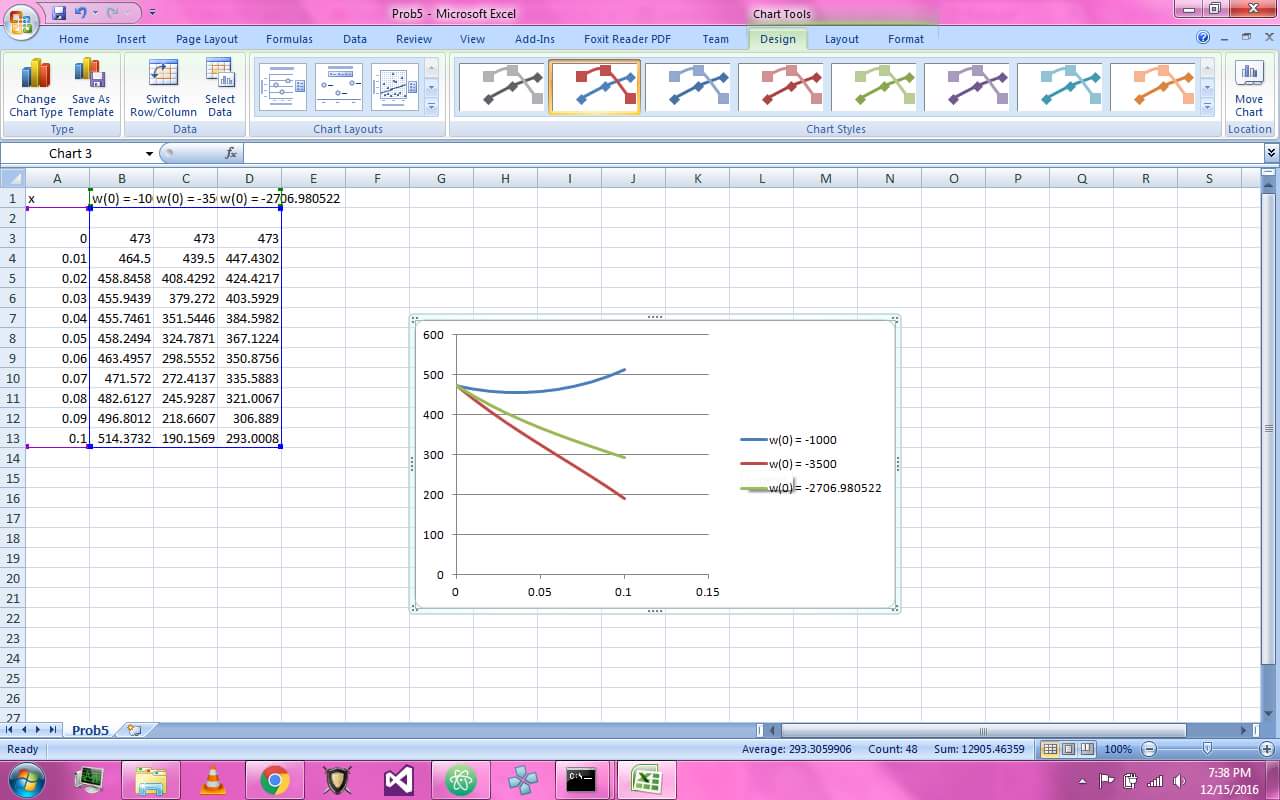
# Details

Let . From the above equation, we derive the following system of first order ODEs.

And we know that ,

The guesses and were successively used. The next guess, **,** calculated using the Secant Method.

The RK-2 output for each guess is given the following screenshot.



# Discussion

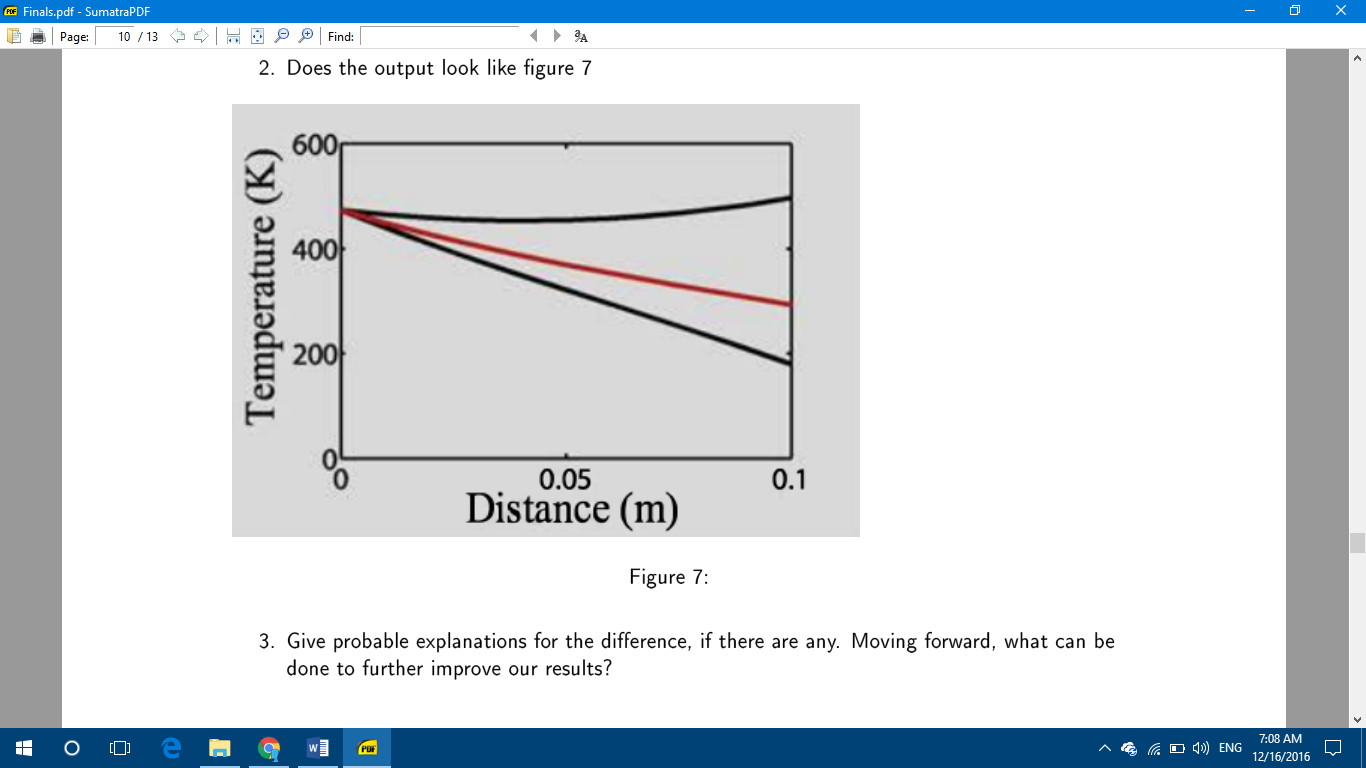
1. In the given equation, the convection term is

as it was stated that is the convective heat transfer coefficient.

and the radiation term is

which uses the Stefan-Boltzmann constant and an emissivity factor. The Stefan-Boltzmann constant is a proportionality constant applied to thermal radiation.

1. The output looks like the provided graph.



1. The RK-2 output is already significantly similar to the expected graph. Results can be improved further by comparing it with results using more guesses made using the Secant Method.