Comments on "Numerical Solution for Variable Viscosity and Internal Heat Generation Effects on Boundary Layer Flow Over an Exponentially Stretching Porous Sheet with Constant Heat Flux and Thermal Radiation" by Ahmed M. Megahed, Journal of Mechanics, Vol. 30, No. 4, June 2014

Mostafa A. A. Mahmoud

Department of Mathematics, Faculty of Science, Benha University (13518), Egypt

E-mail: mostafabdelhameed@yahoo.com

Mustafa.ahmed@fsc.bu.edu.eg

The author [1] studied the effects of thermal radiation , variable viscosity and heat generation on the on boundary layer flow and heat transfer over an exponentially stretching porous sheet with constant heat flux .

The physical quantities of interest in the boundary layer flow and heat transfer studies are the local skin-friction coefficient and the surface heat flux. Unfortunately, **t**here are fundamental errors in the definitions of these quantities in the above paper [1] :

1. The local skin-friction coefficient defined in ref.[1] as

   $C_{f_x} = -(\frac{\mathrm{Re}}{2})^{-1/2} f''(0)$ is wrong.

   The correct form of C_{f_x} obtained as following

   $C_{f_x} = \dfrac{\tau_w}{\frac{1}{2}\rho U^2}$, where the shear stress $\tau_w = (\mu \dfrac{\partial u}{\partial y})_{y=o} = \mu_\infty e^{-\alpha\theta(0)} (\dfrac{\partial u}{\partial y})_{y=o}$,

   Using Eqs.(11) and (13) in ref. [1], the local skin friction coefficient is

   $$C_{f_x} = -(\frac{\mathrm{Re}}{2})^{-1/2} e^{-\alpha\theta(0)} f''(0).$$

2. The boundary condition $-\kappa \dfrac{\partial T}{\partial y} = q(x,t) \quad at\ y = 0$ in Eq.(9) and the transformed boundary condition $\vartheta'(0) = -1$ in Eq.(16) given in ref.[1] are wrong .

   The physical boundary condition for the surface heat flux in the presence of thermal radiation given as : $-\kappa_{eff} \dfrac{\partial T}{\partial y} = q_w \qquad at\ y = 0$, where $\kappa_{eff} = \left(\kappa + \dfrac{16\sigma^* T_0^3}{3k^*}\right)$,

then the transformed boundary condition is : $\vartheta'(0) = \frac{-1}{(1+R)}$, where

$R = \frac{16\sigma^* T_o^3}{3\kappa k^*}$ is thermal radiation parameter .

3. There is a misprint in Eq.(2), the correct form of Eq.(2) is

$$u\frac{\partial u}{\partial x} + v\frac{\partial u}{\partial y} = \frac{1}{\rho}\frac{\partial}{\partial y}(\mu\frac{\partial u}{\partial y}).$$

From the above it was found that the definitions of the local skin-friction C_{f_x} and the surface heat flux boundary conditions in ref.[1] are incorrect . **Since the system of nonlinear ordinary differential equations are coupled (sees Eqs.(14) and (15)) , then all results are wrong.**

References

[1] Megahed, A.M., Journal of Mechanics . 30 (2014) 395 – 402.