Flow past a Flat Plate

Blasius equation: $f''' + f f'' = 0$; $f(\eta) = \frac{\hat{\psi}(\hat{x},\hat{y})}{g(\hat{x})}$; $\eta = \frac{\hat{y}}{g(\hat{x})}$
(Eq. 9.4-9)

Table *Numerical Solution of Flow Along a Flat Plate* $g(\tilde{x}) = (2\tilde{x})^{\frac{1}{2}}$; $\eta = \tilde{y}/(2\tilde{x})^{\frac{1}{2}}$

η	$f(\eta)$	$f'(\eta)$	$f''(\eta)$
0	0	0	0.33206
0.2	0.00681	0.06641	0.33198
0.4	0.02689	0.13276	0.33145
0.6	0.06023	0.19892	0.33003
0.8	0.10676	0.26468	0.32731
1.0	0.16638	0.32971	0.32288
1.2	0.23890	0.39366	0.31641
1.4	0.32406	0.45608	0.30763
1.6	0.42151	0.51650	0.29634
1.8	0.53079	0.57440	0.28259
2.0	0.65135	0.62929	0.26636
2.2	0.78254	0.68071	0.24793
2.4	0.92362	0.72825	0.22766
2.6	1.07379	0.77158	0.20602
2.8	1.23216	0.81049	0.18359
3.0	1.39786	0.84489	0.16098
3.2	1.56998	0.87480	0.13880
3.4	1.74763	0.90037	0.11760
3.6	1.92997	0.92184	0.09787
3.8	2.11621	0.93954	0.07996
4.0	2.30565	0.95388	0.06413
4.2	2.49763	0.96527	0.05047
4.4	2.69164	0.97415	0.03896
4.6	2.88719	0.98093	0.02950
4.8	3.08393	0.98603	0.02190
5.0	3.28553	0.98977	0.01595
5.2	3.47978	0.99247	0.01139
5.4	3.67848	0.99438	0.00797
5.6	3.87750	0.99571	0.00547
5.8	4.07674	0.99661	0.00368
6.0	4.27613	0.99721	0.00243
7.0	5.279	0.9999	—
8.0	6.279	1.000	—

Important: $V_x = U f'(\eta)$; $\tau_0 = \frac{\mu U}{\sqrt{2}\,x}\sqrt{Re_x}\, f''(0)$; $Re_x \equiv \frac{Ux}{\nu}$

$V_y = -\left(\frac{U\nu}{2x}\right)^{\frac{1}{2}} f(\eta) - \frac{1}{2} U y f'(\eta)$