$x := 0.490$ $T := 273.15 + 22.5$ $\kappa := 1.4$ $R := 287$

$$\Delta p_{oi} := \begin{pmatrix} 50+55 \\ 55+60 \\ 60+65 \\ 68+73 \\ 75+80 \\ 80+84 \\ 86+92 \\ 91+95 \\ 96+101 \\ 99+105 \\ 102+108 \\ 105+111 \\ 108+114 \\ 110+117 \\ 112+120 \\ 114+120 \\ 115+122 \\ 116+124 \end{pmatrix} \qquad y_i := \begin{pmatrix} 0.1 \\ 0.2 \\ 0.3 \\ 0.5 \\ 0.7 \\ 1 \\ 1.3 \\ 1.6 \\ 1.9 \\ 2.2 \\ 2.5 \\ 2.8 \\ 3.1 \\ 3.5 \\ 4.0 \\ 4.5 \\ 5.0 \\ 5.5 \end{pmatrix}$$

$p_j := (5+3)\cdot 9.8067 + 100200$ $p_j = 1.003 \times 10^5$ Па

$\Delta p_j := 5 + 3$

$i := 0..17$

Давление полного торможения

$\varepsilon := \frac{p_j}{p_{oi}}$ $p_{oi} := \Delta p_{oi}\cdot 9.8067 + 100200$

$p_{oi} =$ Па

	0
0	$1.012\cdot10^5$
1	$1.013\cdot10^5$
2	$1.014\cdot10^5$
3	$1.016\cdot10^5$
4	$1.017\cdot10^5$
5	$1.018\cdot10^5$
6	$1.019\cdot10^5$
7	$1.02\cdot10^5$
8	$1.021\cdot10^5$
9	$1.022\cdot10^5$
10	$1.023\cdot10^5$
11	$1.023\cdot10^5$
12	$1.024\cdot10^5$
13	$1.024\cdot10^5$
14	$1.025\cdot10^5$
15	$1.025\cdot10^5$
16	$1.025\cdot10^5$
17	$1.026\cdot10^5$

$$M := \sqrt{\frac{2\cdot\left(\frac{1}{\varepsilon}\right)^{\frac{\kappa-1}{\kappa}} - 2}{\kappa - 1}}$$

$\varepsilon =$

	0
0	0.991
1	0.99
2	0.989
3	0.987
4	0.986
5	0.985
6	0.984
7	0.983
8	0.982
9	0.981
10	0.981
11	0.98
12	0.98
13	0.979
14	0.979
15	0.978
16	0.978
17	0.978

$M =$

	0
0	0.116
1	0.122
2	0.128
3	0.136
4	0.143
5	0.147
6	0.154
7	0.157
8	0.162
9	0.165
10	0.167
11	0.17
12	0.172
13	0.174
14	0.176
15	0.177
16	0.178
17	0.179

Числа Маха

$$\lambda_i := \sqrt{\frac{(\kappa+1)\cdot(M_i)^2}{2 + (\kappa-1)\cdot(M_i)^2}}$$

$\lambda_i =$

0.127
0.133
0.14
0.149
0.156
0.161
0.168
0.172
0.177
0.18
0.183
0.186
0.188
0.19
0.192
0.193
0.195
0.196

Значение безразмерной скорости

Т.к. $\lambda_\delta < 0.3$ то применяем уравнение Бернулли

$$\frac{c_i}{c_\delta} = \sqrt{\frac{p_{oi} - p_j}{p_{oi\_max} - p_j}}$$

$$c_{теор} := \sqrt{\frac{p_{oi} - p_j}{p_{oi_{17}} - p_j}}$$

$\frac{\lambda_i}{\lambda_{17}} =$

0.649
0.682
0.713
0.759
0.798
0.822
0.858
0.877
0.904
0.92
0.934
0.948
0.961
0.972
0.983
0.987
0.994
1

$\frac{y_i}{y_{i_{17}}} =$

	0
0	0.018
1	0.036
2	0.055
3	0.091
4	0.127
5	0.182
6	0.236
7	0.291
8	0.345
9	0.4
10	0.455
11	0.509
12	0.564
13	0.636
14	0.727
15	0.818
16	0.909
17	1

$c :=$

0.649
0.682
0.713
0.759
0.798
0.822
0.858
0.877
0.904
0.92
0.934
0.948
0.961
0.972
0.983
0.987
0.994
1

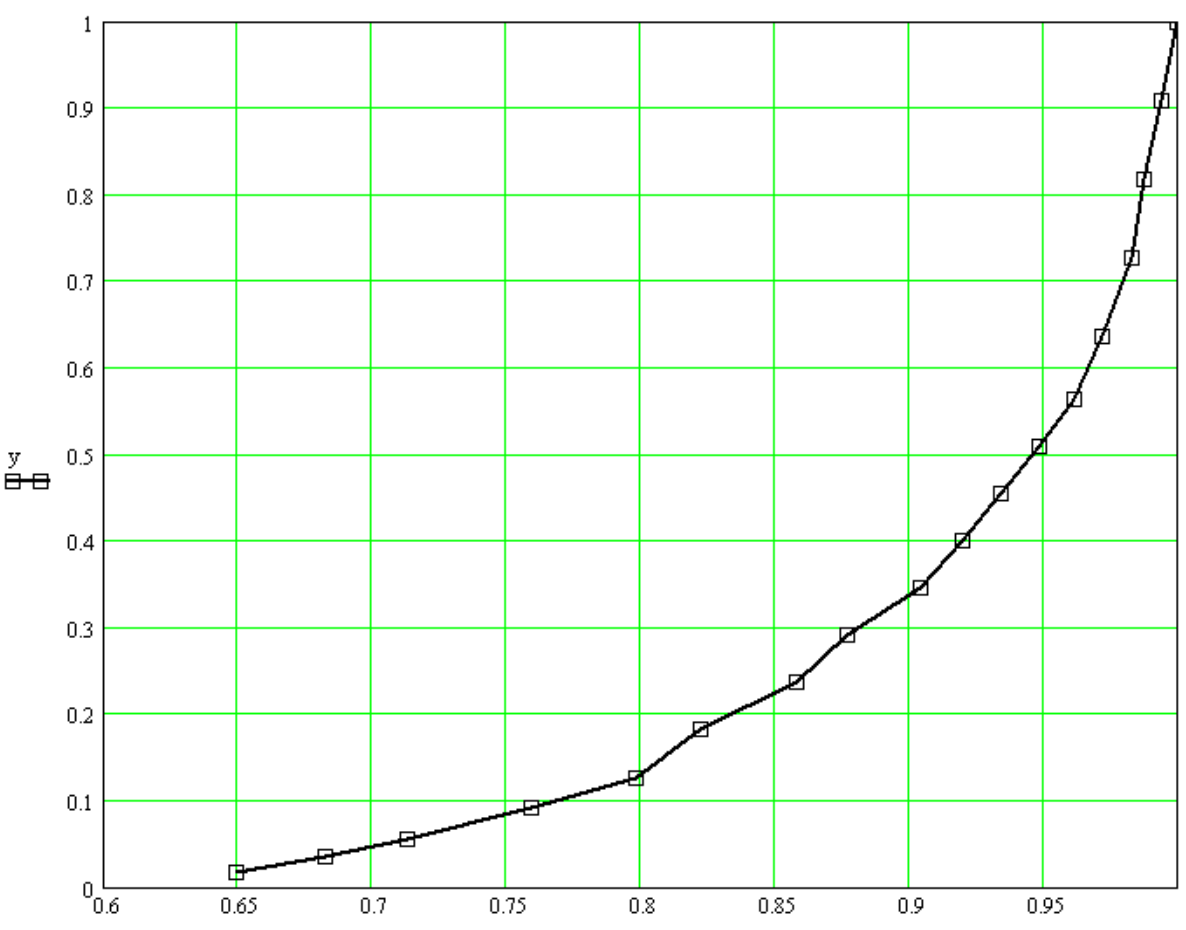
$y :=$

0.018
0.036
0.055
0.091
0.127
0.182
0.236
0.291
0.345
0.4
0.455
0.509
0.564
0.636
0.727
0.818
0.909
1

Теоретическое распределение скоростей

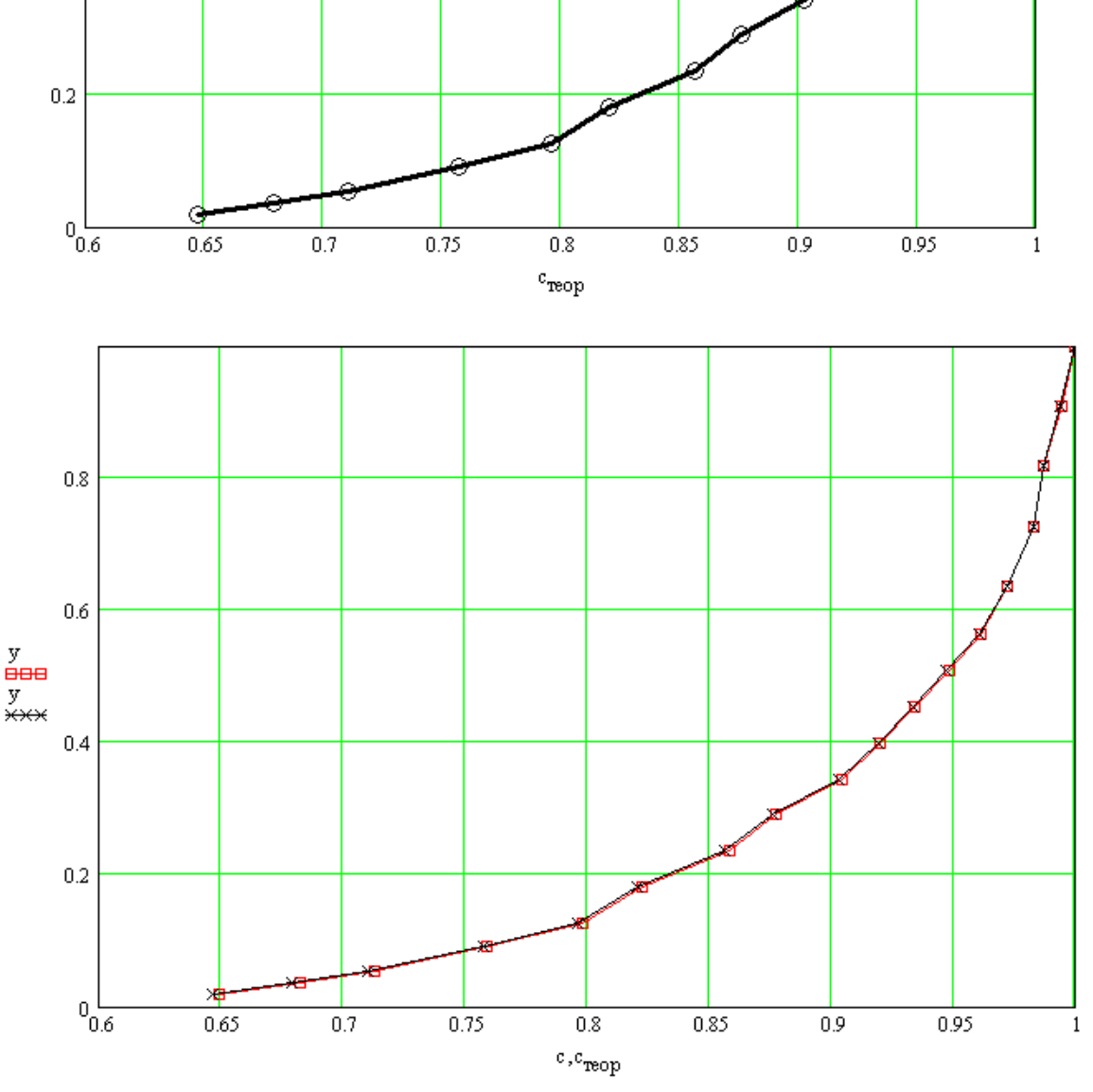
$\sqrt{\frac{p_{oi} - p_j}{p_{oi_{17}} - p_j}} =$

	0
0	0.647
1	0.679
2	0.71
3	0.757
4	0.796
5	0.82
6	0.856
7	0.876
8	0.903
9	0.919
10	0.933
11	0.947
12	0.96
13	0.972
14	0.983
15	0.987
16	0.994
17	1



c

Теоретическое распределение скоростей



Значение числа Рейнольдса

$Re := \frac{\lambda\cdot a\cdot x}{\nu}$ $a := \sqrt{\frac{2\kappa}{\kappa+1}R\cdot T}$ $\nu := 1.49\cdot10^{-5}\ \frac{м^2}{с}$

$a = 314.632$

$Re =$

	0
0	$1.315\cdot10^6$
1	$1.381\cdot10^6$
2	$1.444\cdot10^6$
3	$1.539\cdot10^6$
4	$1.617\cdot10^6$
5	$1.665\cdot10^6$
6	$1.738\cdot10^6$
7	$1.778\cdot10^6$
8	$1.831\cdot10^6$
9	$1.864\cdot10^6$
10	$1.892\cdot10^6$
11	$1.92\cdot10^6$
12	$1.947\cdot10^6$
13	$1.969\cdot10^6$
14	$1.991\cdot10^6$
15	$2\cdot10^6$
16	$2.013\cdot10^6$
17	$2.026\cdot10^6$

Теоретический профиль скорости для турбулентного пограничного слоя на плоской пластине

$\Delta p_0 := (150 + 146)\cdot 9.8067$

$\Delta p_0 = 2.903 \times 10^3$ Па

$$\frac{c_i}{c_\delta} = \left(\frac{y_i}{\delta}\right)^{\frac{1}{7}}$$

$$\rho_0 := \frac{\Delta p_0 + 100200}{R\cdot T} \qquad \rho_0 = 1.215\ \frac{кг}{м^3}$$

$$c_i := \sqrt{\frac{2\cdot|\Delta p_{oi} - \Delta p_j|}{\rho_0}}$$

$$c_{бескон} := \sqrt{\frac{2\cdot\left(\Delta p_{oi_{17}} - \Delta p_j\right)}{\rho_0}}$$

$c_{бескон} = 19.541\ \frac{м}{с}$

$c_i =$ $\frac{м}{с}$

	0
0	12.636
1	13.271
2	13.877
3	14.796
4	15.555
5	16.024
6	16.728
7	17.117
8	17.638
9	17.961
10	18.234
11	18.503
12	18.768
13	18.986
14	19.201
15	19.287
16	19.415
17	19.541

$$c_{безразм} := \frac{c_i}{c_{бескон}}$$

$\delta := \frac{y_{i_{16}}}{\frac{c_{16}}{c_{17}}}$ $\delta = 5.03$ мм

$$y_{i\_безразм} := \frac{y_i}{\delta}$$

$c_{безразм} =$

	0
0	0.647
1	0.679
2	0.71
3	0.757
4	0.796
5	0.82
6	0.856
7	0.876
8	0.903
9	0.919
10	0.933
11	0.947
12	0.96
13	0.972
14	0.983
15	0.987
16	0.994
17	1

$y_{i\_безразм} =$

	0
0	0.02
1	0.04
2	0.06
3	0.099
4	0.139
5	0.199
6	0.258
7	0.318
8	0.378
9	0.437
10	0.497
11	0.557
12	0.616
13	0.696
14	0.795
15	0.895
16	0.994
17	1.093

$\left(\frac{y_i}{\delta}\right)^{\frac{1}{7}} =$

	0
0	0.571
1	0.631
2	0.668
3	0.719
4	0.754
5	0.794
6	0.824
7	0.849
8	0.87
9	0.889
10	0.905
11	0.92
12	0.933
13	0.95
14	0.968
15	0.984
16	0.999
17	1.013

$\frac{c}{c_{16}} =$

	0
0	0.653
1	0.686
2	0.717
3	0.764
4	0.803
5	0.827
6	0.863
7	0.882
8	0.909
9	0.926
10	0.94
11	0.954
12	0.967
13	0.978
14	0.989
15	0.993
16	1
17	1.006