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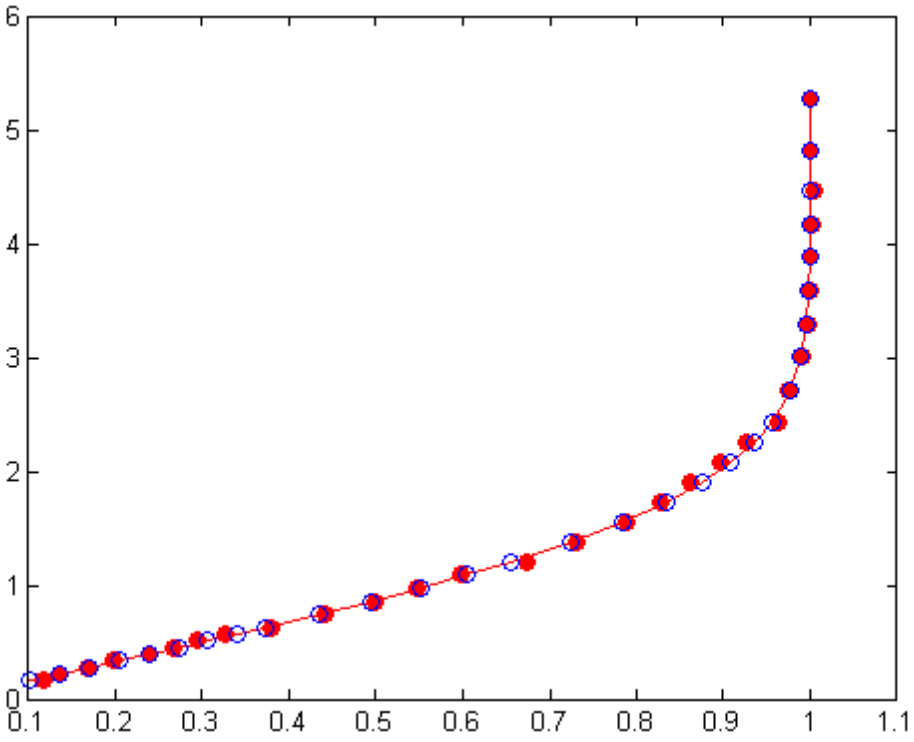
```
clear all;
clc;

nu = 1.6151E-5;
```

EXERCISE 1

```
[Y50, Uy50] = read_lab_data_JF3('FPG_G01_X50');
[Y74, Uy74] = read_lab_data_JF3('FPG_G01_X74');
[Y98, Uy98] = read_lab_data_JF3('FPG_G01_X98');

%Ta bort dåliga mätpunkter
Y50 = Y50(3:end); Uy50 = Uy50(4:end);
Y74 = Y74(3:end); Uy74 = Uy74(4:end);
Y98 = Y98(3:end); Uy98 = Uy98(4:end);

[Ywall50, ny50] = FPG_LAB_JF_P1(Y50, Uy50);
[Ywall74, ny74] = FPG_LAB_JF_P1(Y74, Uy74);
[Ywall98, ny98] = FPG_LAB_JF_P1(Y98, Uy98);

Ue50 = .5*(Uy50(end)+Uy50(end-1));
Ue74 = .5*(Uy74(end)+Uy74(end-1));
Ue98 = .5*(Uy98(end)+Uy98(end-1));

%Lägga till no-slip
Y50 = [0; Y50-Ywall50]; Uy50 = [0; Uy50];
Y74 = [0; Y74-Ywall74]; Uy74 = [0; Uy74];
Y98 = [0; Y98-Ywall98]; Uy98 = [0; Uy98];

%Integrera fram delta*
Uy50int = 1-Uy50/Ue50; deltaS50 = trapz(Y50, Uy50int);
Uy74int = 1-Uy74/Ue74; deltaS74 = trapz(Y74, Uy74int);
Uy98int = 1-Uy98/Ue98; deltaS98 = trapz(Y98, Uy98int);

%Integrera fram theta
Uy50thetaint = (Uy50/Ue50).*(1-Uy50/Ue50); theta50 = trapz(Y50, Uy50thetaint);
Uy74thetaint = (Uy74/Ue74).*(1-Uy74/Ue74); theta74 = trapz(Y74, Uy74thetaint);
Uy98thetaint = (Uy98/Ue98).*(1-Uy98/Ue98); theta98 = trapz(Y98, Uy98thetaint);

%Shape factors
H50 = deltaS50/theta50;
H74 = deltaS74/theta74;
H98 = deltaS98/theta98;
```

```
H = (H50 + H74 + H98) / 3; %=> n = 0.04 (från graf i labpek)

n = (ny50 + ny74 + ny98)/3; %=> n = 0.0369
[f, fp, fpp, fppp, eta] = FS_solver_JF(n);

b = trapz(eta, (1-fp));
```

```
par =

   0.013987196945849  -0.132867471169308


par =

   0.046878890991211  -0.103039562475488


par =

   0.049846679383772  -0.077127908907711
```




```
h = figure(1);
clf
hold on
title('Fig 1: unscaled profiles');
```

```
xlabel('Y (mm)');
ylabel('U (m/s)');
plot(Uy50, Y50, 'r')
plot(Uy74, Y74, 'g')
plot(Uy98, Y98, 'b')
legend('50','74','98')
saveas(h, 'figure_1', 'jpg');


h = figure(2);
clf
hold on
title('Fig 2: scaled profiles including Falkner-Skan profile');
xlabel('\eta');
ylabel('u/U_e');
plot(Uy50/Ue50, Y50/deltaS50, 'r')
plot(Uy74/Ue74, Y74/deltaS74, 'g')
plot(Uy98/Ue98, Y98/deltaS98, 'b')
plot(fp, eta, 'r')
% plot(fp, eta/b, 'b')
saveas(h, 'figure_2', 'jpg');
% Att FS inte ligger på våra profiler kan bero på att FS
% använder eta =  y/delta, medan vi använder eta* = y /delta*

h = figure(3);
clf
hold on
title('Fig 3: scaled profiles including scaled Falkner-Skan profile');
xlabel('\eta');
ylabel('u/U_e');
plot(Uy50/Ue50, Y50/deltaS50, 'r')
plot(Uy74/Ue74, Y74/deltaS74, 'g')
plot(Uy98/Ue98, Y98/deltaS98, 'b')
plot(fp, eta/b, 'r*')
saveas(h, 'figure_3', 'jpg');

% FRAMTAGNA VÄRDEN
% ny50 = 0.0139871969458492
% ny74 = 0.046878890991211
% ny98 = 0.0498466793837723
% n = 0.0369042557736109
% b = 1.54869242062851
% H50 = 2.5473563198362
% H74 = 2.47624859491766
% H98 = 2.47840147379582
% H_avg = 2.50066879618323
```

Fig 1: unscaled profiles

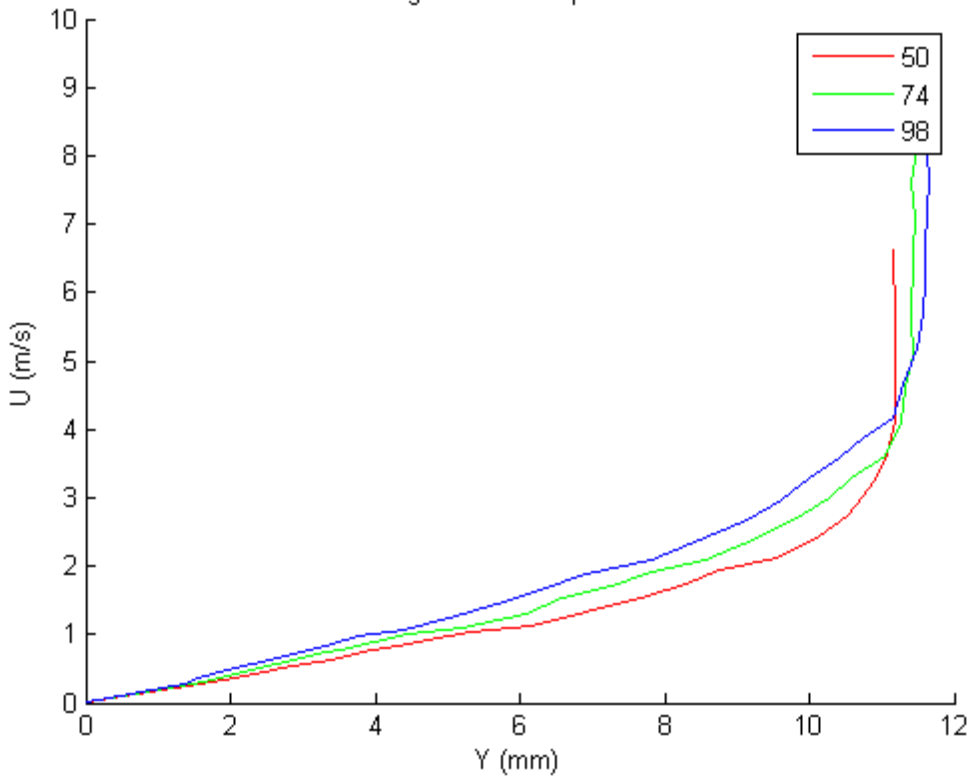
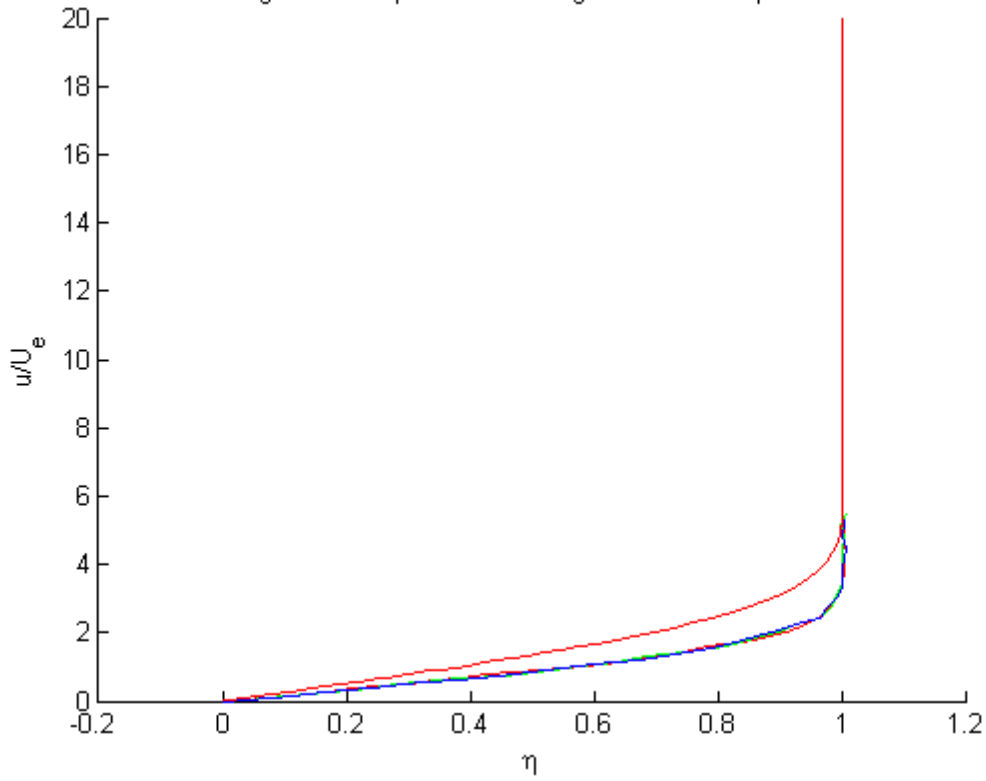
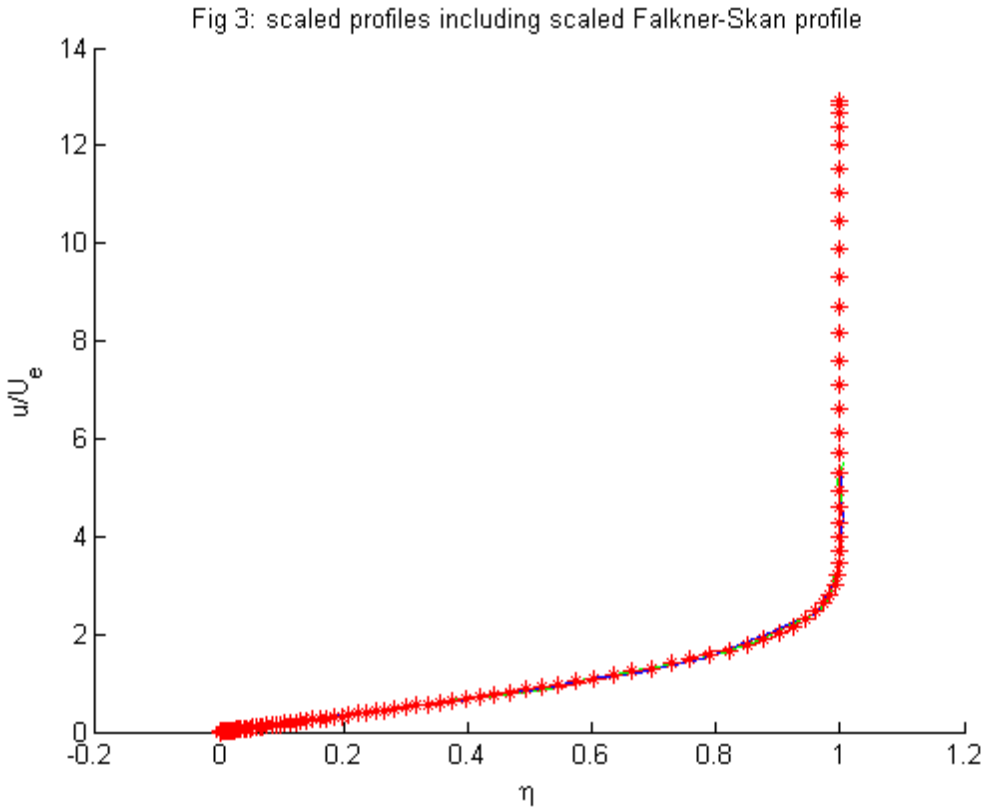


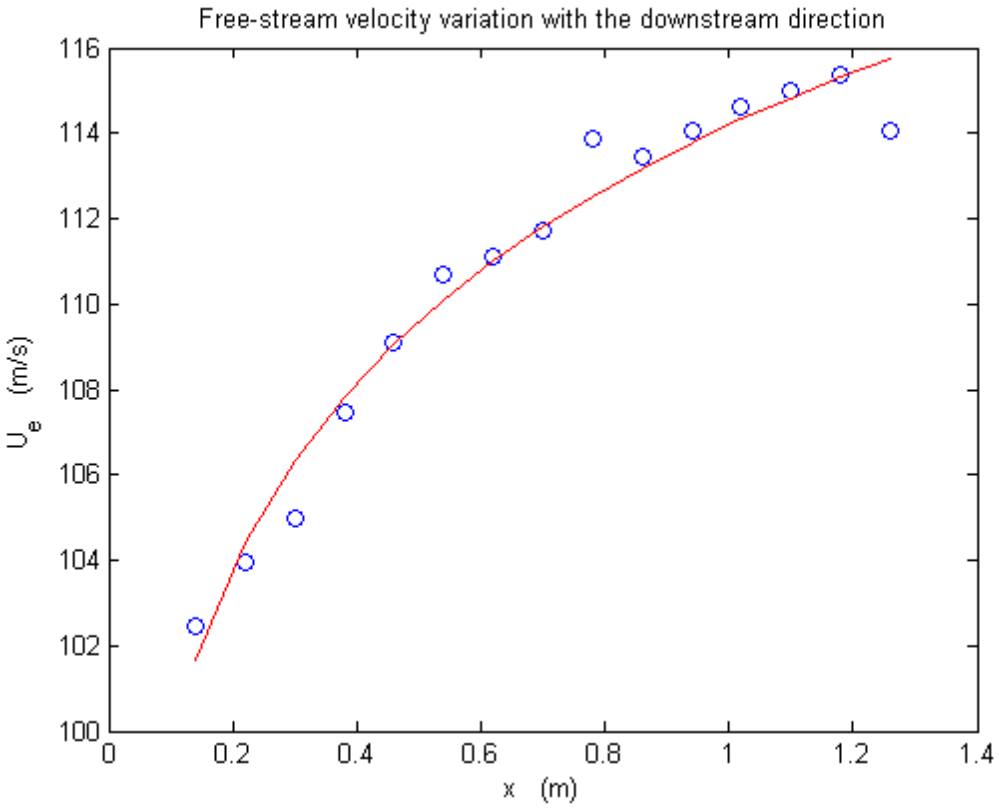
Fig 2: scaled profiles including Falkner-Skan profile





EXERCISE 2

```
rho = 1.1823;
rho_meth = 776;
g = 9.82;
beta = deg2rad(20);

[X,h] = read_lab_data_JF3('PressureHeight');

delta_h = h(1:end-1) - h(end);
delta_p = rho_meth * g * delta_h * sin(beta);


U_inf = sqrt(2*delta_p / rho);

h = figure(4);
nx = Ufit_JF(X, U_inf); %nx = 0.0590860830884698
saveas(h, 'stream_velocity_fit', 'jpg');
```


Free-stream velocity variation with the downstream direction
116
114
112
110
108
106
104
102
100
U_e (m/s)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
x (m)

EXERCISE 4

```
clc
dS74 = deltaS74/1000; %convert mm to m
t74 = theta74/1000; %convert mm to m
delta_exp = dS74;

delta_theo = delta_exp / b;

cf_theo = 2*nu/delta_theo / Ue74 * fpp(1);

fpp_ny = fpp;
[~,~,fpp_nx,~,~] = FS_solver_JF(nx);

Re = Ue74 * t74 / nu;
c = t74/delta_theo;
cf_exp = @(n) 2*(c^2*(1-n)/2/Re + n*(c/Re)^2 * Ue74 / nu *(dS74 + 2*t74));
cf_exp_nx = cf_exp(nx);
cf_exp_ny = cf_exp(ny74);

cf_theo; % 0.001184789174690
cf_exp_nx; %0.001361741445475
cf_exp_ny; %0.001271805870832
cf_exp_nx / cf_theo; %1.149353382496054
cf_exp_ny / cf_theo; %1.073444877789601
```

Published with MATLAB® R2013b