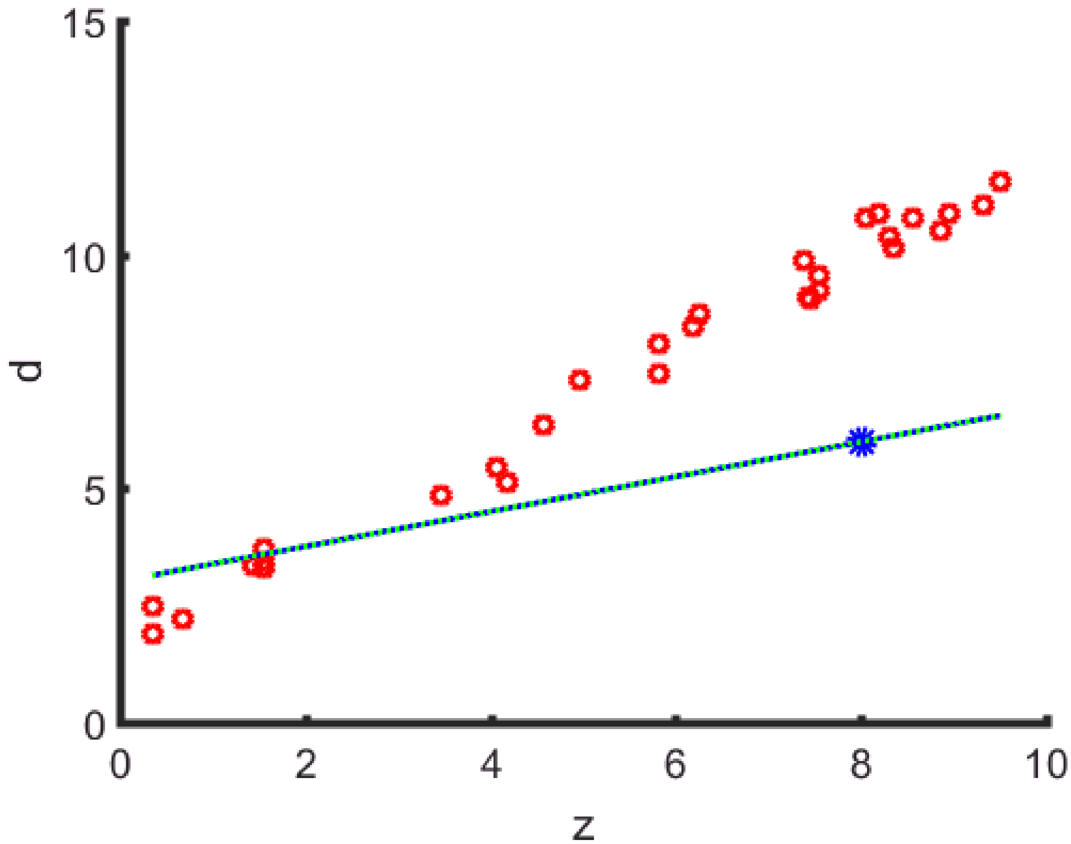
```
% gda03_11
%
% constrained least squares fit to synthetic data
% supports Figure 3.13

clear all;

% z's
N=30;
zmin=0;
zmax=10;
z = sort(random('Uniform',zmin,zmax,N,1));

% d = a + b*z + noise
a=2.0;
b=1.0;
sd=0.5;
dobs = a+b*z+random('Normal',0,sd,N,1);

% constraint
zp = 8;
dp = 6;

% constrained least squares fit
M=2;
G=[ones(N,1), z];
F = [1, zp];
A = [ [G'*G, F']', [F, 0]' ];
b = [ [G'*dobs]', dp ]';
mest = A\b;

% predicted data
dpre = G*mest(1:M);
e = dobs - dpre;
[emax, iemax] = max(abs(e));

% plot
figure(1);
clf;

% plot scale
pdmin=0;
pdmax=15;

% plot observed and presicted data, constained point
set(gca,'LineWidth',3);
set(gca,'FontSize',14);
hold on;
axis( [zmin, zmax, pdmin, pdmax ]' );
plot( z, dobs, 'ro', 'LineWidth', 2);
plot( zp, dp, 'bo', 'LineWidth', 4);
plot( z, dpre, 'b-', 'LineWidth', 2);
xlabel('z');
ylabel('d');

% Weighted least squares fit as a check.
% The idea is to set the weight on the
% prior information to a very large number
% so that it functions as a hard constraint.
```

```
wd = 1;
wh = 1e6;
FF = [G*wd; F*wh ];
ff = [dobs*wd; dp*wh];
mest2 = (FF'*FF)\(FF'*ff);
dpre2 = G*mest2;
plot( z, dpre2, 'g:', 'LineWidth', 2);
```




```
% Figure [AU Note: was 3.11] 3.13 Least squares fitting of a straight line to (z, d) data,
% where the line is constrained to pass through the point (z′, d′) = (8, 6).
```