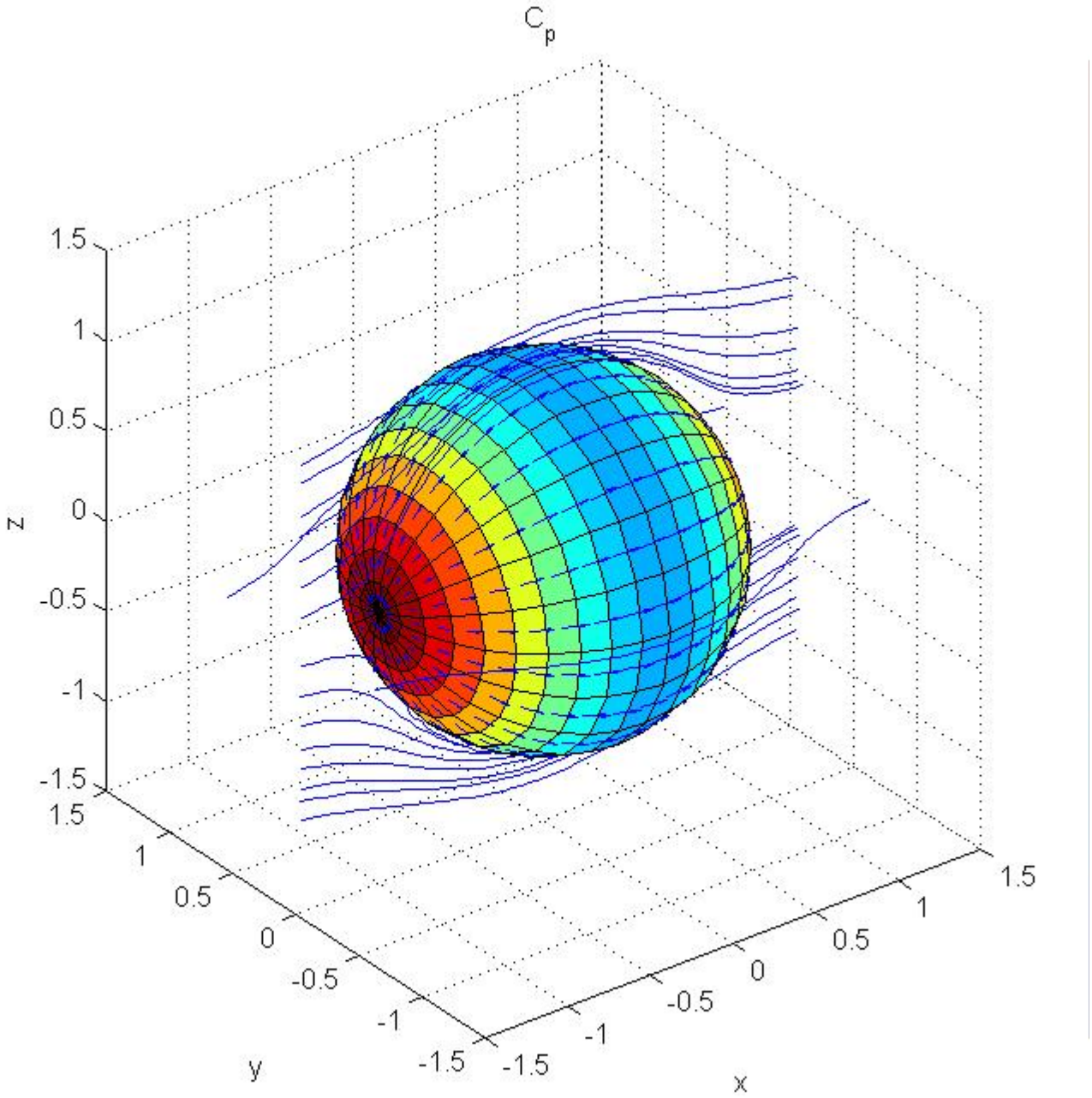
1 (a) Moments are zero because the pressure can only act radially inward on a sphere, and thus can generate no moment about the origin at the body center. Streamline plot for sphere follows

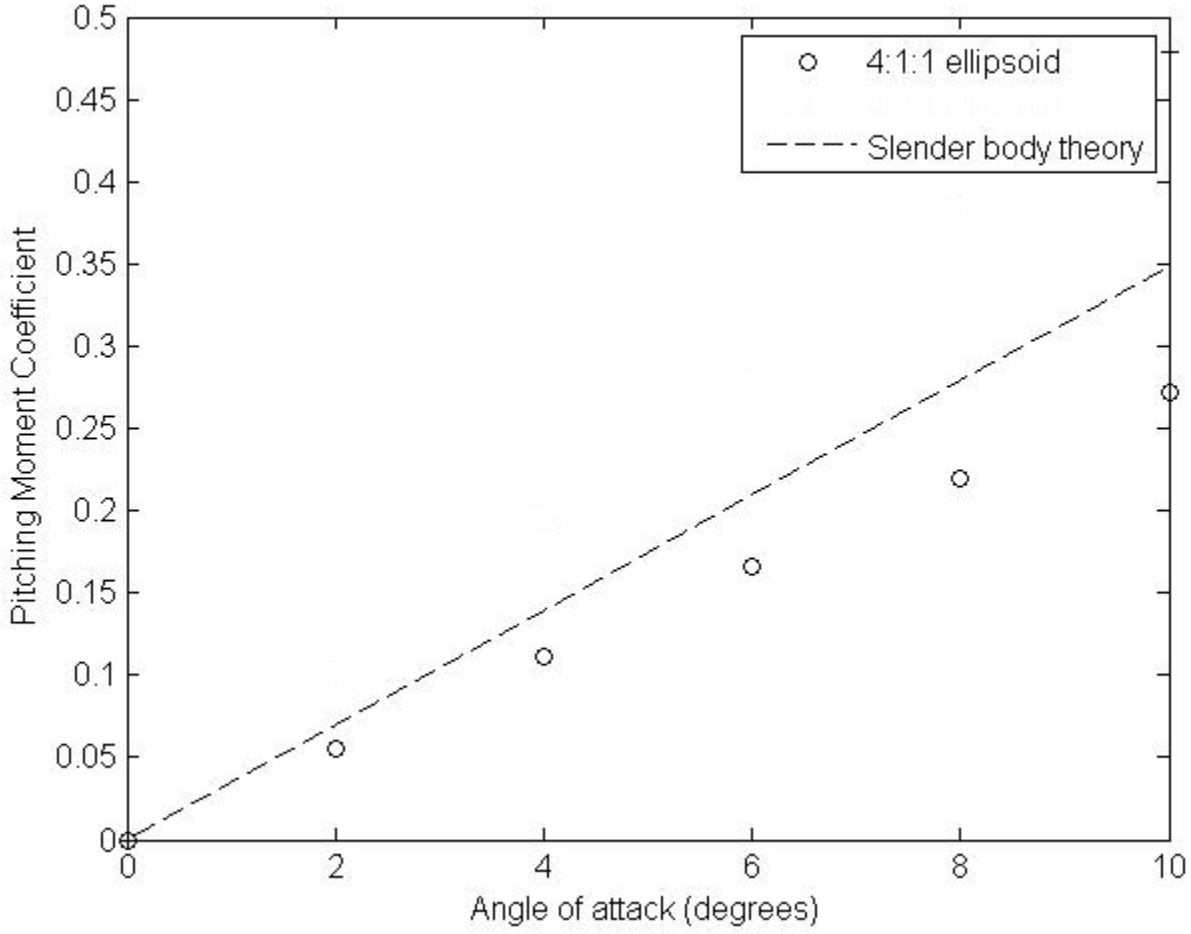


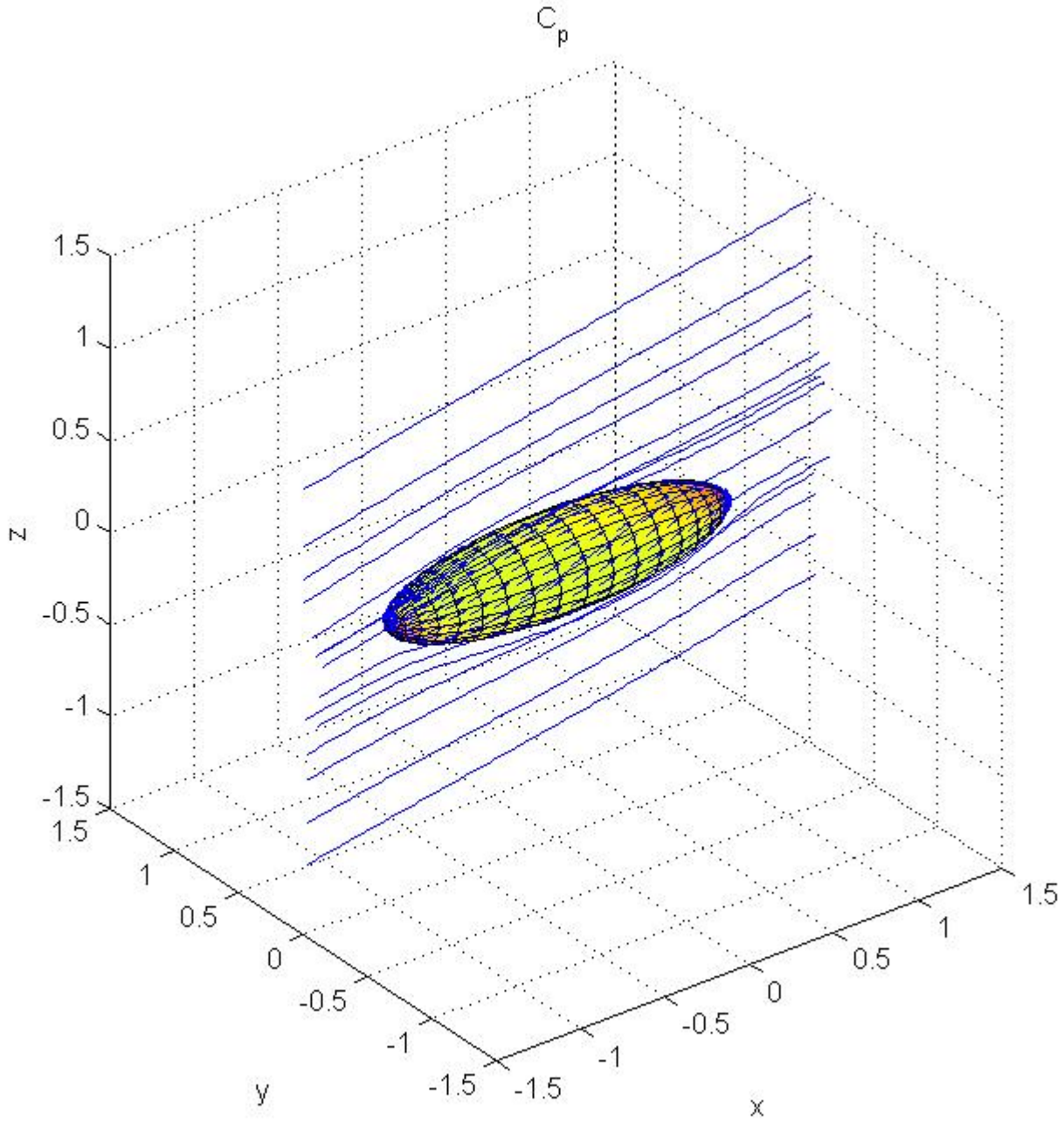
(b) Pitching moment coefficient is zero for zero angle of attack (not surprising). Plot not included.

(c) Table of moment coefficients:

Angle of attack (deg.)	0	2	4	6	8	10
C_P (4:1:1 ellipsoid)	0	0.0556	0.1109	0.1657	0.2196	0.2725

Plot of moment coefficients vs. slender body theory:




C_p
1.5
1
0.5
0
-0.5
-1
-1.5
z
1.5
1
0.5
0
-0.5
-1
-1.5
y
1.5
1
0.5
0
-0.5
-1
-1.5
x

2. (a) $c_A = \frac{S}{b} = \frac{845}{78.9} = 10.71\ m$

(b) $c_A = \frac{c_R + c_T}{2} = 10.71$

$\rightarrow \frac{c_R + 0.26c_R}{2} = 10.71 \rightarrow \ c_R = 17\ m$

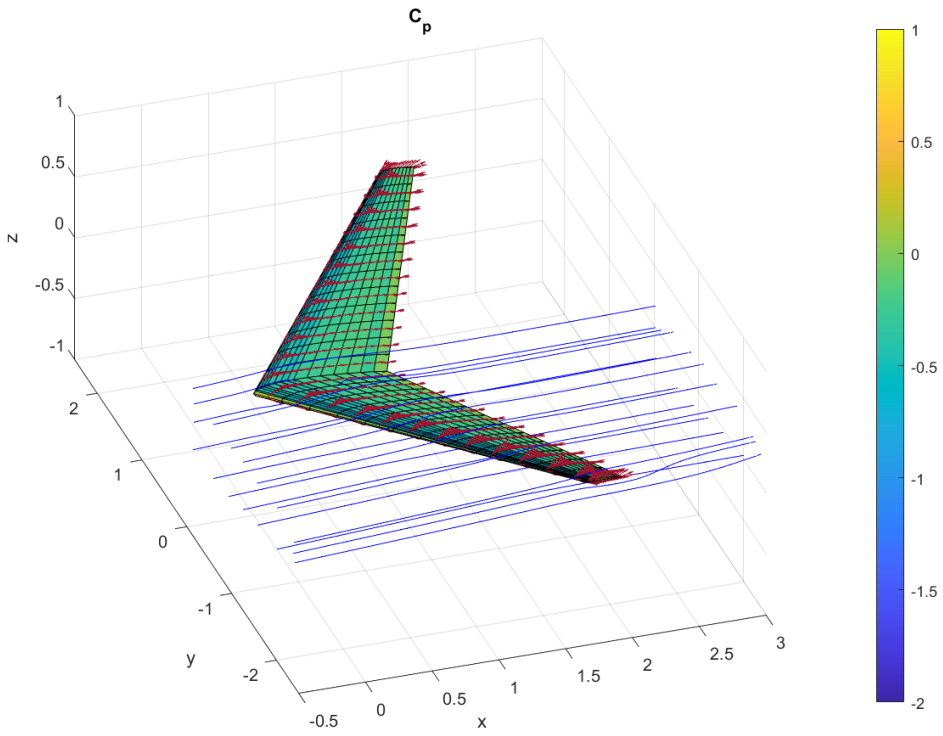
So, $\frac{b}{c_R} = \frac{78.9}{17} = 4.64$

So, appropriate code is

```
%3D doublet panel method for lifting wings.
clear all;
vinf=[cos(3*pi/180);0;sin(3*pi/180)]; %free stream velocity

%Specify wing geometry (NACA 0012 section)
xp=[1    0.9 0.8 …];
zp=[0    0.01448 0.02623 …];
nb=25;b=4.64;sweep=33.5;dihedral=5.6;twist=0;taper=0.26;
[r,rc,nw,sw,se,ne,no,we,so,ea,wp,bp]=wing(xp,zp,b,nb,vinf,sweep,dihedral,twis
t,taper);
xl=-0.5;xh=3;yl=-2.5;yh=2.5;zl=-1;zh=1;cl=-2;ch=1; % plotting limits
```

The predicted $C_L = 0.3082$



(c) $C_L = L/0.5\rho V_\infty^2 S$ so $V_\infty = \sqrt{L/0.5\rho C_L S} = \sqrt{560{,}000 \times 9.81/(0.5 \times 1.225 \times 0.3082 \times 845)}$

=185 m/s. This is reasonable flight speed for an A380, but not a reasonable speed for an incompressible calculation, since it is a Mach number of close to half.