% Ge102 HW2 Winter 2014

%

% Find the radial density structure of earth by integrating

% Adams-Williamson equation

[r, z, a, b] = textread('PREM.txt', '%f %f %f %f', ...

'headerlines', 5, 'commentstyle', 'shell');

% Remaining mass, density and gravity at different depths

M\_rem = zeros(1, length(r));

M\_shell = zeros(1, length(r));

d = zeros(1, length(r));

g = zeros(1, length(r));

I = zeros(1, length(r));

r = r\*1000;

z = z\*1000;

Me = 5.974e24; % Mass of earth, in kg

M\_rem(1) = Me; % Remaining mass of earth

d(1) = 3300; % surface density, in kg/m^3

g(1) = 9.81; % surface gravity, in m/s^2

inertia = 0.0;

% Loop over depth segment from surface down to core

for i = 2:length(r)

% TODO: Calculate seismic parameter, change in radius, and hence

% the shell mass, remaining mass, new gravity and new density

% sp = seismic parameter

sp = a(i)^2-4/3\*b(i)^2;

dr = r(i-1)-r(i);

M\_shell(i) = 4/3\*pi\*(r(i-1)^3-r(i)^3)\*d(i-1);

M\_rem(i) = M\_rem(i-1)-M\_shell(i);

% g(i) = 6.67\*10^-11\*M\_rem(i)/(r(i))^2;

g(i) = 6.67\*10^-11\*M\_rem(i)/(6370000)^2;

% g(i) = g(i-1)-6.67\*10^-11\*(M\_shell)/(r(i-1)-r(i))^2;

d(i) = d(i-1)/(1+g(i)/sp\*dr);

if r(i) == 5970821

d(i) = d(i)\*1.05;

end

if r(i) == 5701911

d(i) = d(i)\*1.09;

end

if r(i) == 3480536

d(i) = 9900;

end

% TODO: Account for density jumps at ICB, CMB, 670 and 410

end

% Make plots

plot(r,a)

xlabel('Radius (m)')

ylabel('a (m/s)')

figure

plot(r,b)

xlabel('Radius (m)')

ylabel('b (m/s)')

figure

plot(r,g)

xlabel('Radius (m)')

ylabel('g (m/s^2)')

figure

plot(r,d)

xlabel('Radius (m)')

ylabel('density (kg/m^3)')







