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%Simon Popecki
%OE 757
%Homework 2

%*****This homework is late and incomplete because I broke my leg and
 have to go to the
%hospital nearly every day for some kind of scan or doctors meeting



clear all;
close all;
```

Problem 1

```
%Constants/given values
H=1.5; %m, wave height
h=3; %m, water depth
Kr=0.7; %refraction coefficient (unitless)
T=10; %s, period of wave
Hr=H/Kr; %relating wave height to refraction coefficient
t=linspace(0,60,600); %60 second time series with 60 points (10 points
 per second)

[Lr,Lo,kr,sigma]=find_L_disper(h,T);

%Locations for sea surface elevation
```

Problem 3

```
T=10; %s, Period of wave
gra=1/50; %grade of the beach
H=3; %water depth
thperp=0; %degrees, offshore angle of incidence
th45=45; %degrees, offshore angle of incidence
h=85; %deep water
[Lr,Lo,kr,sigma]=find_L_disper(h,T);
dlim=h/Lr; %deepwater limit
x=h/gra; %distance to deep water from the shoreline

%Plotting Ks,Kr,theta,H vs. distance offshore
```

```
x=linspace(0,x); %100 points between deep water and shore
h=gra*x;

%pushing array through functions, simple method
for k=1:length(h)
    [Lr(k),Lo(k),kr(k),sigma(k)]=find_L_disper(h(k),T);
    C(k)=Lr(k)/T;
    n(k)=.5*(1+(2*kr(k)*h(k))/sinh(2*kr(k)*h(k)));
end

for j=1:length(h)-1
    Ks(j)=sqrt((n(j)*Lr(j))/(n(j+1)*Lr(j+1)));
end

%Perpendicular
for gra=1:length(C)
    a0deg(gra)=asind((C(gra)*sind(thperp))/C(end)); %remember to use
 degrees sine instead of radians!
    Kr0deg(gra)=sqrt(cosd(thperp)/cosd(a0deg(gra)));
end

%45 degrees angle of incidence
for n=1:length(C)
    a45deg(n)=asind((C(n)*sind(th45))/C(end));
    Kr45deg(n)=sqrt(cosd(th45)/cosd(a45deg(n)));
end

for m=1:length(C)-1
    H0deg(m)=Kr0deg(m)*Ks(m);
    H45deg(m)=Kr45deg(m)*Ks(m);
end

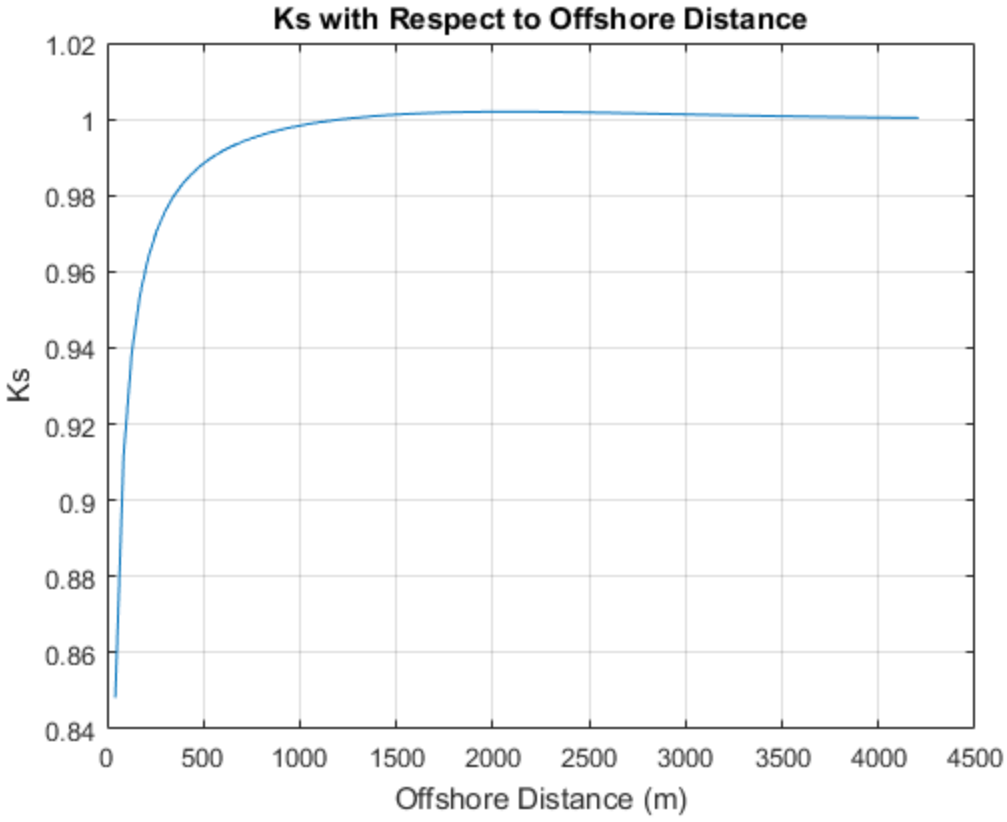
figure(1)
plot(x(1:end-1),Ks)
title('Ks with Respect to Offshore Distance')
xlabel('Offshore Distance (m)')
ylabel('Ks')
grid on

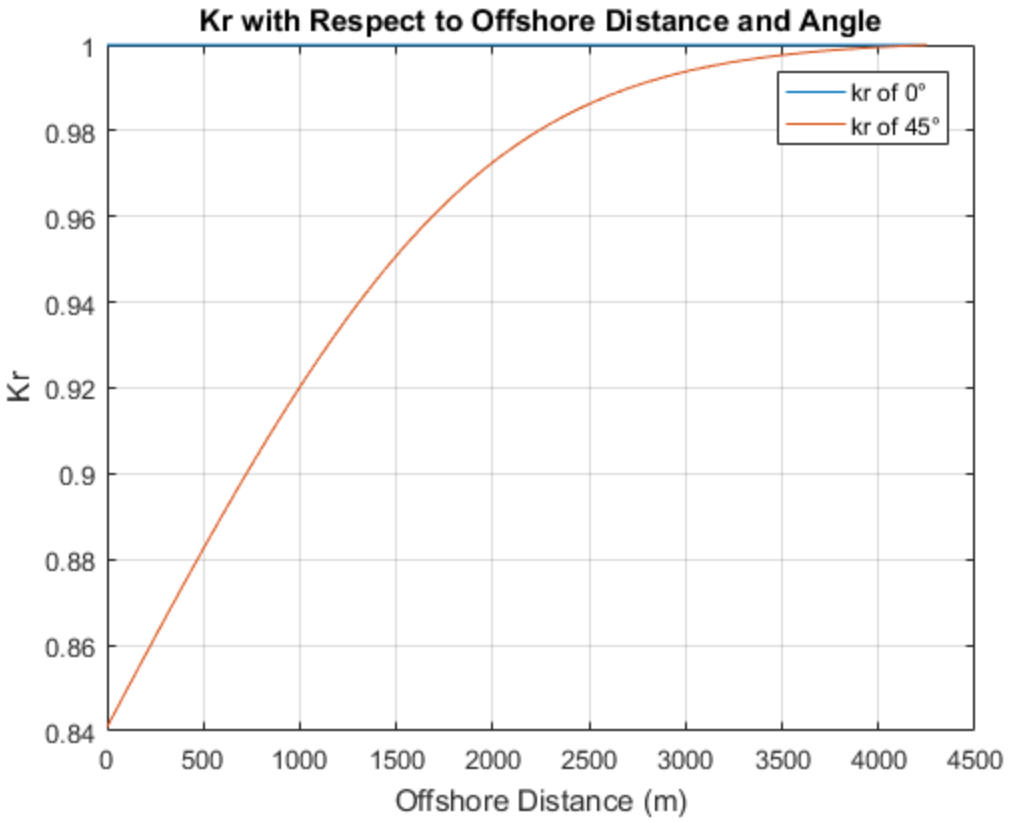
figure(2)
plot(x,Kr0deg,x,Kr45deg)
title('Kr with Respect to Offshore Distance and Angle')
xlabel('Offshore Distance (m)')
ylabel('Kr')
legend('kr of 0°','kr of 45°')
grid on

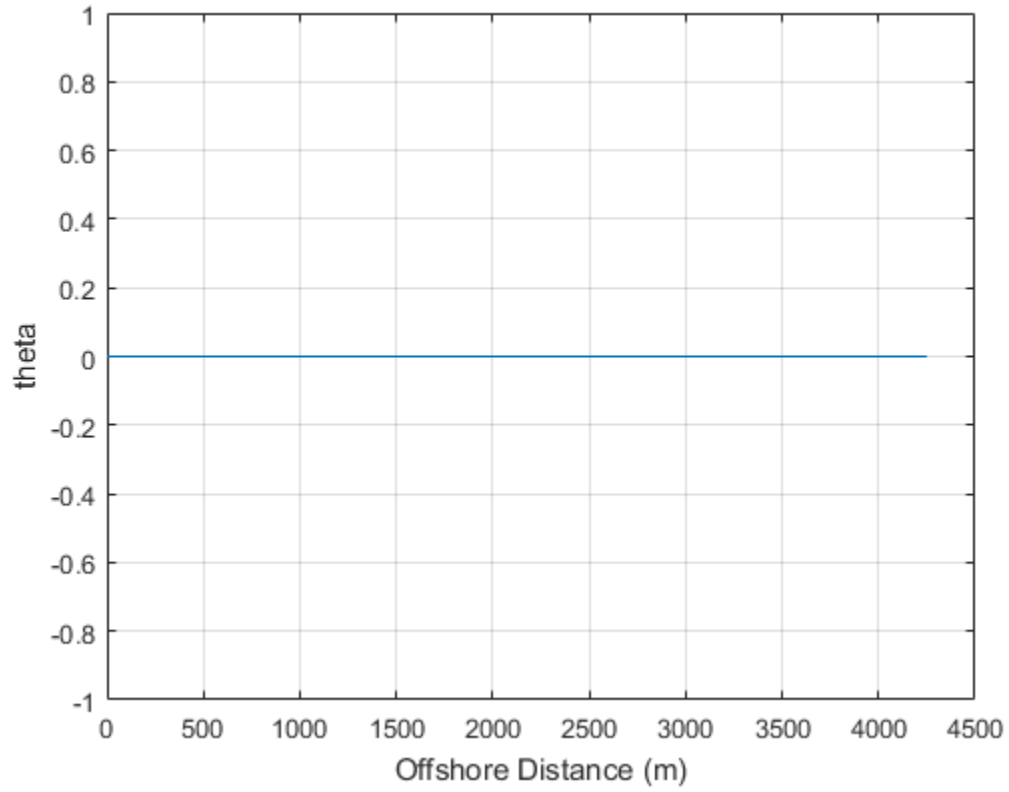
figure(3)
plot(x,a0deg)
xlabel('Offshore Distance (m)')
ylabel('theta')
grid on

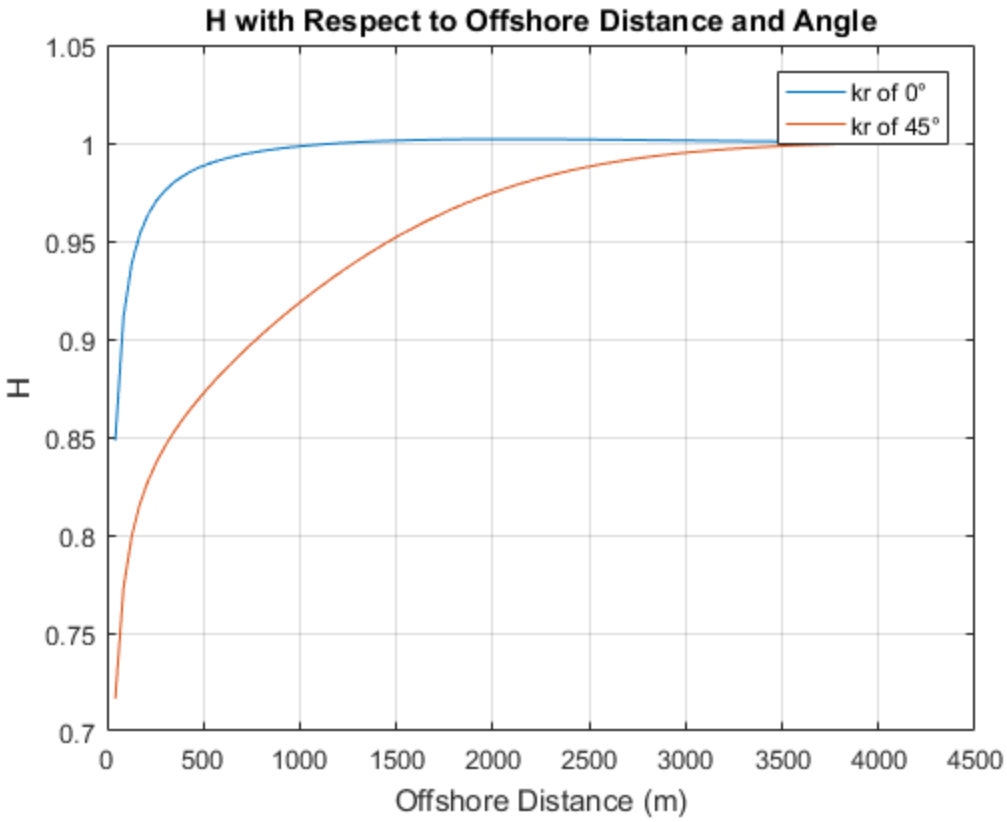
figure(4)
```

```
plot(x(1:end-1),H0deg,x(1:end-1),H45deg)
legend('kr of 0°','kr of 45°')
title('H with Respect to Offshore Distance and Angle')
xlabel('Offshore Distance (m)')
ylabel('H')
grid on
```




Kr with Respect to Offshore Distance and Angle
kr of 0°
kr of 45°
Kr
Offshore Distance (m)
1
0.98
0.96
0.94
0.92
0.9
0.88
0.86
0.84
0
500
1000
1500
2000
2500
3000
3500
4000
4500


theta
Offshore Distance (m)
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
500
1000
1500
2000
2500
3000
3500
4000
4500



Problem 4

```
T=10; %s, wave period
H=3; %m, wave height
gra=1/200; %grade of the beach
thperp=0; %deg., angle of incidence (perpendicular)
th45=40; %deg., angle of incidence 40 degrees
h=90; %dwl=h/Lr >.5 deep water (m)

[Lr,Lo,kr,sigma]=find_L_disper(h,T);
dlim=h/Lr;      %deepwater limit
x=h/gra;       %distance from shore to deepwater limit
x=linspace(0,x);
h=gra*x;

for i=1:length(h)
    [Lr(i),Lo(i),kr(i),sigma(i)]=find_L_disper(h(i),T);
    n(i)=.5*(1+(2*kr(i)*h(i))/sinh(2*kr(i)*h(i)));
    C(i)=Lr(i)/T;
end
for j=1:length(h)-1
    Ks(j)=sqrt((n(j)*Lr(j))/(n(j+1)*Lr(j+1)));
end

%0 degrees perpendicular
```

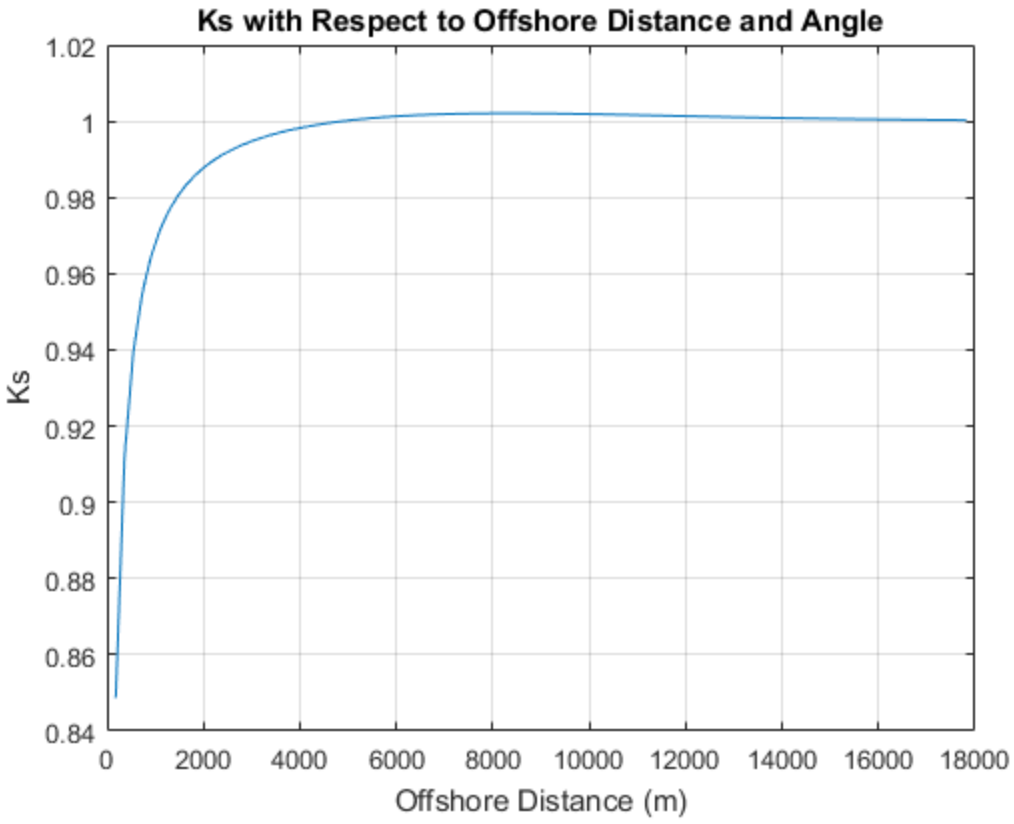
```
for k=1:length(C)
    a0deg(k)=asind((C(k)*sind(thperp))/C(end)); %use degrees
    Kr0deg(k)=sqrt(cosd(thperp)/cosd(a0deg(k)));
end

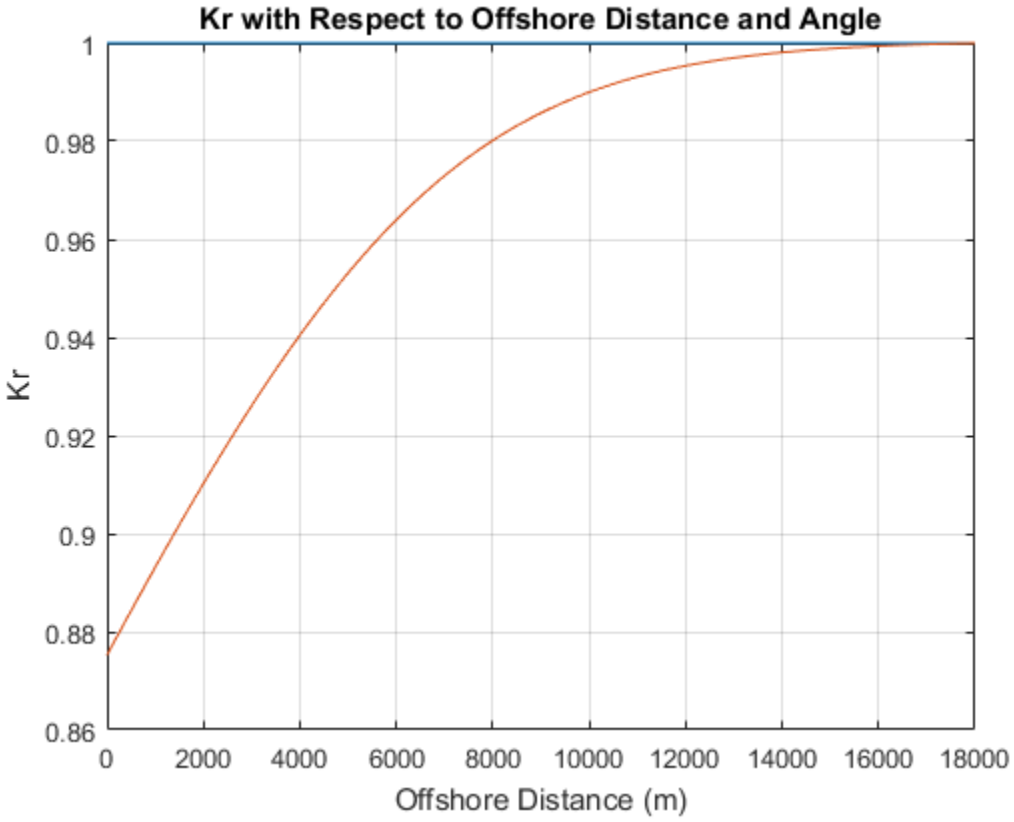
%45 degrees
for m=1:length(C)
    a45deg(m)=asind((C(m)*sind(th45))/C(end));
    Kr45deg(m)=sqrt(cosd(th45)/cosd(a45deg(m)));
end

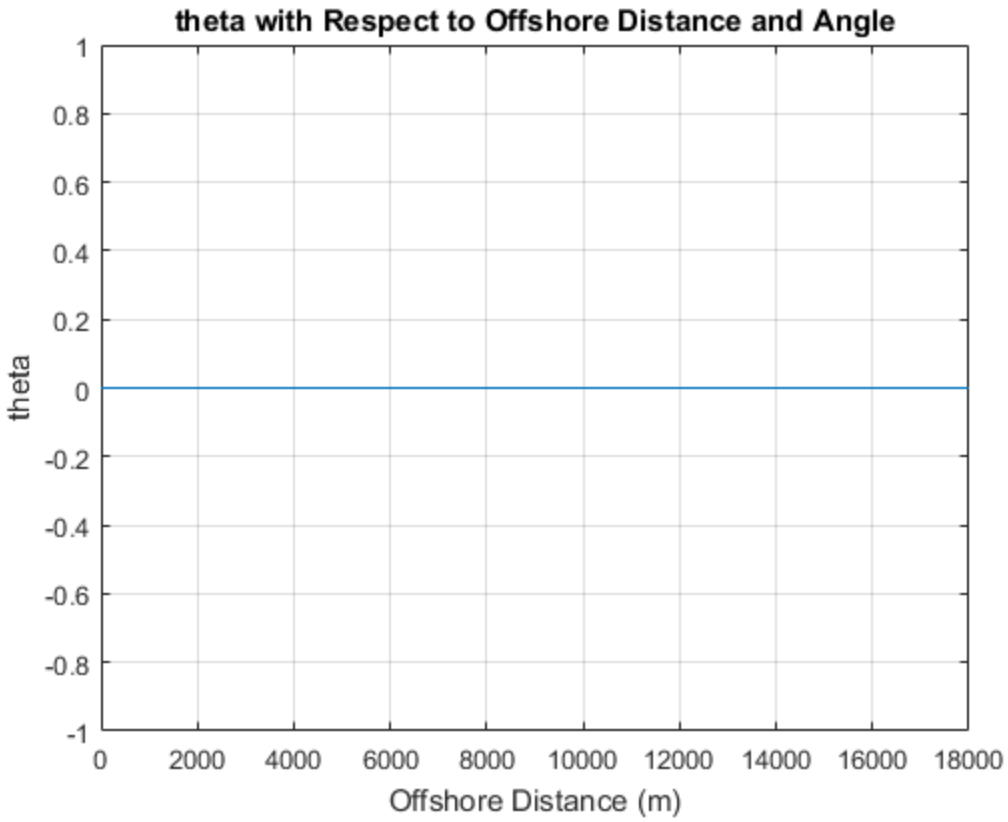
%plotting results
figure(5)
plot(x(1:end-1),Ks)
xlabel('Offshore Distance (m)')
ylabel('Ks')
title('Ks with Respect to Offshore Distance and Angle')
grid on

figure(6)
plot(x,Kr0deg,x,Kr45deg)
title('Kr with Respect to Offshore Distance and Angle')
xlabel('Offshore Distance (m)')
ylabel('Kr')
grid on

figure(7)
plot(x,a0deg)
xlabel('Offshore Distance (m)')
ylabel('theta')
title('theta with Respect to Offshore Distance and Angle')
grid on
```


Ks with Respect to Offshore Distance and Angle
1.02
1
0.98
0.96
0.94
0.92
0.9
0.88
0.86
0.84
Ks
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
Offshore Distance (m)


Kr with Respect to Offshore Distance and Angle
1
0.98
0.96
0.94
0.92
0.9
0.88
0.86
Kr
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
Offshore Distance (m)



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