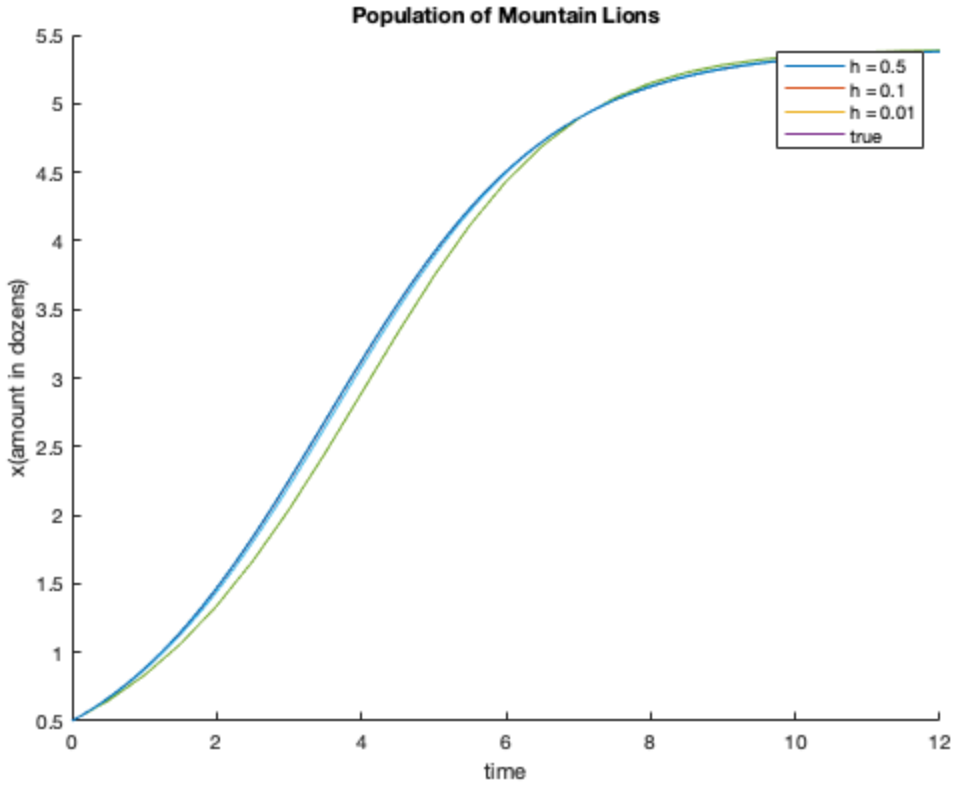
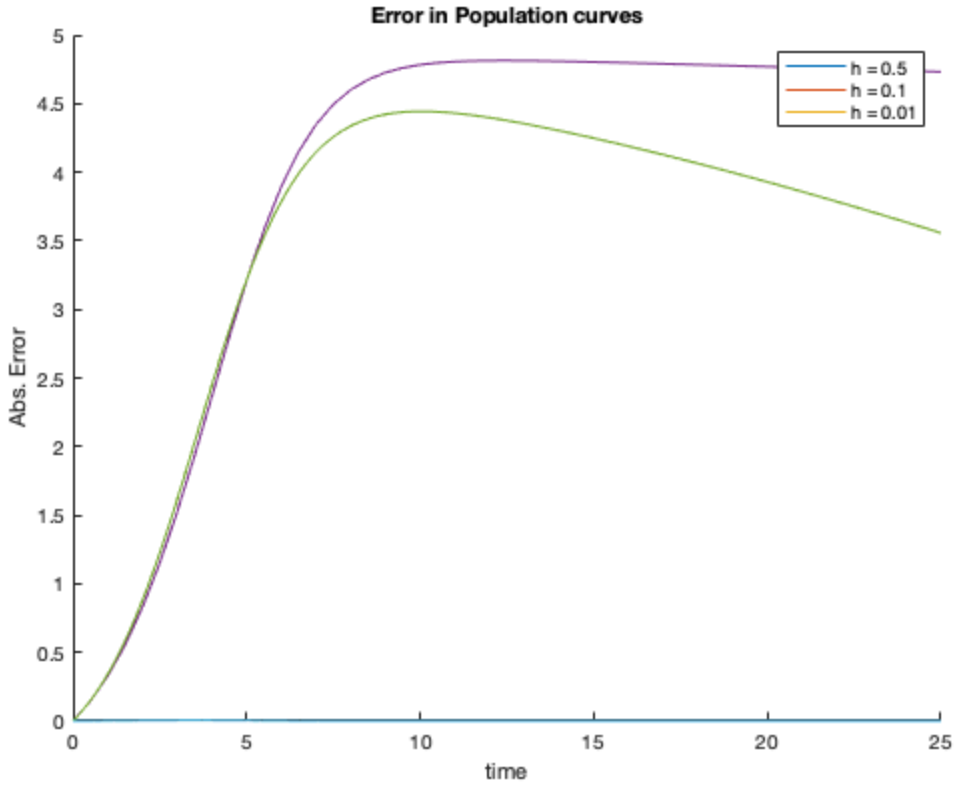
Euler approximation code for Section 2, Question 3 a

```
x_prime = @(t,x) .65*x.*(1-x/5.4);
h1 = .5;
h2 = .1;
h3 = .01;
t1 = 0:h1:25;
t2 = 0:h2:25;
t3 = 0:h3:25;
x1 = zeros(1,length(t1));
x1(1) = .5;
x2 = zeros(1,length(t2));
x2(1) = .5;
x3 = zeros(1,length(t3));
x3(1) = .5;
for n = 1:(length(t1)-1)
    x1(n+1) = x1(n) + h1*x_prime(t1(n),x1(n));
end
for n = 1:(length(t2)-1)
    x2(n+1) = x2(n) + h2*x_prime(t3(n),x2(n));
end
for n = 1:(length(t3)-1)
    x3(n+1) = x3(n) + h3*x_prime(t3(n),x3(n));
end
xo = .5;
r = .65;
lm = 5.4;
t = 0:.01:25;
x = (xo*exp(r*t)*lm)./(lm-xo+(xo*exp(r*t)));

figure(1)
hold on
plot(t1,x1,'LineWidth', .3)
plot(t2,x2,'LineWidth', .4)
plot(t3,x3,'LineWidth', .7)
plot(t,x,'LineWidth', 1)
xlabel('time'), ylabel('x(amount in dozens)'), title("Population of
 Mountain Lions")
legend("h = 0.5","h = 0.1","h = 0.01","true")
axis([0 12 .5 5.5])

hold off
```



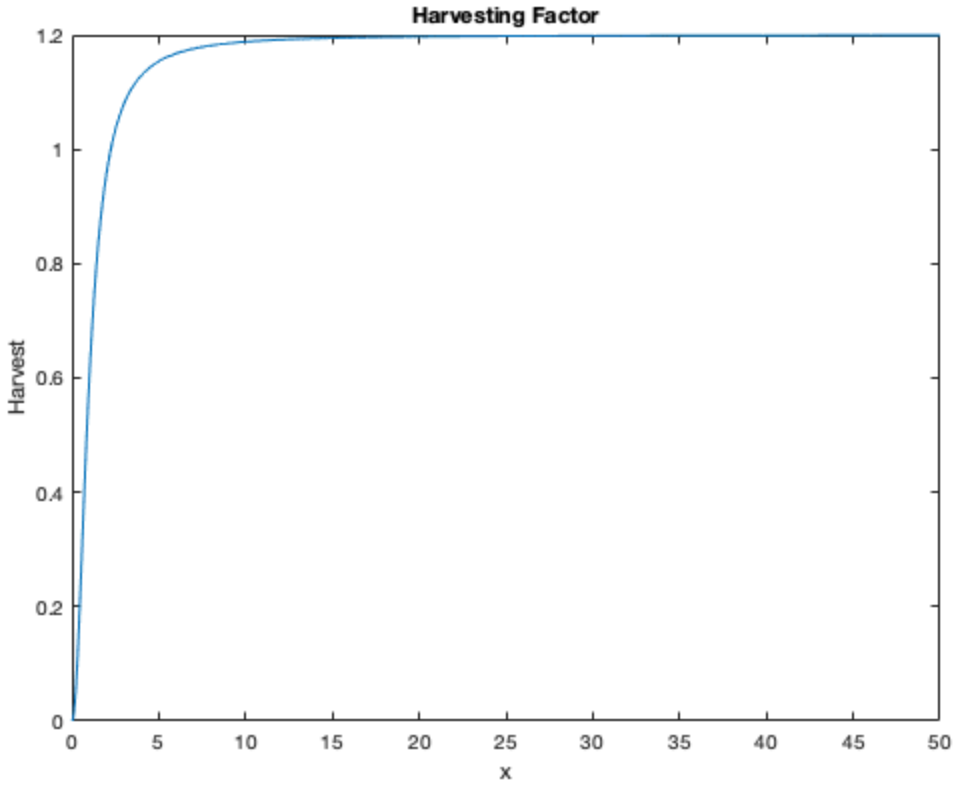
Error in Eulers method for Section 2, Question 3 b

```
e1 = abs(x(1:51)-x1);
e2 = abs((x(1:251)-x2));
e3 = abs((x-x3));
figure(2)
hold on
semilogy(t1,e1,t2,e2,t3,e3)
xlabel('time'), ylabel('Abs. Error'), title("Error in Population
 curves")
legend("h = 0.5","h = 0.1","h = 0.01")
hold off
```



Plotting the Harvest Factor

```
p = 1.2;
q = 1;
xxx = 0:.01:50;
figure(3)
hx = p*xxx.^2./(q+xxx.^2);
plot(xxx,hx);
xlabel('x'), ylabel('Harvest'), title("Harvesting Factor")
```



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```
% Eulers method with Harvest Factor, Section 2, Question 6
r = .65;
L = 8.1;
p = 1.2;
q = 1;
h = @(x) p*x.^2./(q+x.^2);
x_prime = @(t,x) r*x.*(1-x/L)-h(x);
h1 = .01;
t1 = 0:h1:75;
x1 = zeros(1,length(t1));
x1(1) = 2;
x2 = zeros(1,length(t1));
x2(1) = 10;
x3 = zeros(1,length(t1));
x3(1) = 1.8;
x4 = zeros(1,length(t1));
x4(1) = 0.1;
for n = 1:(length(t1)-1)
    x1(n+1) = x1(n) + h1*x_prime(t1(n),x1(n));
end
for n = 1:(length(t1)-1)
    x2(n+1) = x2(n) + h1*x_prime(t1(n),x2(n));
end
for n = 1:(length(t1)-1)
    x3(n+1) = x3(n) + h1*x_prime(t1(n),x3(n));
end
for n = 1:(length(t1)-1)
    x4(n+1) = x4(n) + h1*x_prime(t1(n),x4(n));
end
% dirfield.m
%{
function dirfield(f,tval,yval,plot_title)
[tm,ym]=meshgrid(tval,yval);
dt = tval(2) - tval(1);
dy = yval(2) - yval(1);
fv = vectorize(f);
if isa(f,'function_handle')
  fv = eval(fv);
end
yp=feval(fv,tm,ym);
s = 1./max(1/dt,abs(yp)./dy)*0.35;
h = ishold;
quiver(tval,yval,s,s.*yp,0,'.r'); hold on;
quiver(tval,yval,-s,-s.*yp,0,'.r');
if h
  hold on
else
  hold off
end
axis([tval(1)-dt/2,tval(end)+dt/2,yval(1)-dy/2,yval(end)+dy/2])

title(plot_title);
```