%InvasivePythons.m

%By James Kizler & Charles Scruggs

%Description: Here we are modeling the population of eggs (E), Juveniles (J), and

% adult Pythons (A)

clear all

close all

%Declare Variables

End\_time = 15; %This is the number of days we are looking out at

h = 0.01; %Step size (i.e. this is h days, so if h = 0.1 each step is 1/10 of a day

total\_steps = floor(End\_time/h); %This is the total number of time steps

E = zeros(total\_steps,1); %Array for the egg populations. We start this out as zeros

J = zeros(total\_steps,1); %Array for the baby populations. We start this out as zeros

A = zeros(total\_steps,1); %Array for the adult populations. We start this out as zeros

E\_prime = zeros(size(E)); %Array for the rate of change of E. We start this out as zeros

J\_prime = zeros(size(J)); %Array for the rate of change of J. We start this out as zeros

A\_prime = zeros(size(A)); %Array for the rate of change of A. We start this out as zeros

%Rate constants

b = 10; %Birth rate

d\_bh = .8; %death before hatching

d\_p =.38; %death by people

d\_n = .04; %death by natural causes

M\_ej = 1; %Maturation of eggs to juniors

M\_ja = .33; %Maturation of juniors to adults

%Initial Populations

E(1) = 0; %Start out with no eggs

J(1) = 0; %Start out with no babies

A(1) = 10; %Start out with 10 adults

%Beginning the time stepping

for i = 1:total\_steps

%Setting up the rates of change for E, B, and A

E\_prime(i) = b\*A(i) - d\_bh\*E(i) - d\_p\*E(i) - M\_ej\*E(i);

J\_prime(i) = M\_ej\*E(i) - d\_n\*J(i) - d\_p\*J(i) - M\_ja\*J(i);

A\_prime(i) = M\_ja\*J(i) - d\_p\*A(i) - d\_n\*A(i);

%Euler Integration

E(i+1) = E(i) + h\*E\_prime(i);

J(i+1) = J(i) + h\*J\_prime(i);

A(i+1) = A(i) + h\*A\_prime(i);

end

%Time array (for the x-axis)

time = linspace(0,End\_time,total\_steps+1)';

figure(1)

plot(time, E,'r')

hold on

plot(time, J,'g')

plot(time, A,'b')

legend('Eggs','Juveniles','Adults')

xlabel('Time (Years)')

ylabel('Population')

title('Invasive Pythons')