CSM 321 Lab Submission

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IDD M&C Part 3

01 Nov 2023

```
% FIRST ORDER ODE

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% Roll : 21124015
% 4th October 2023

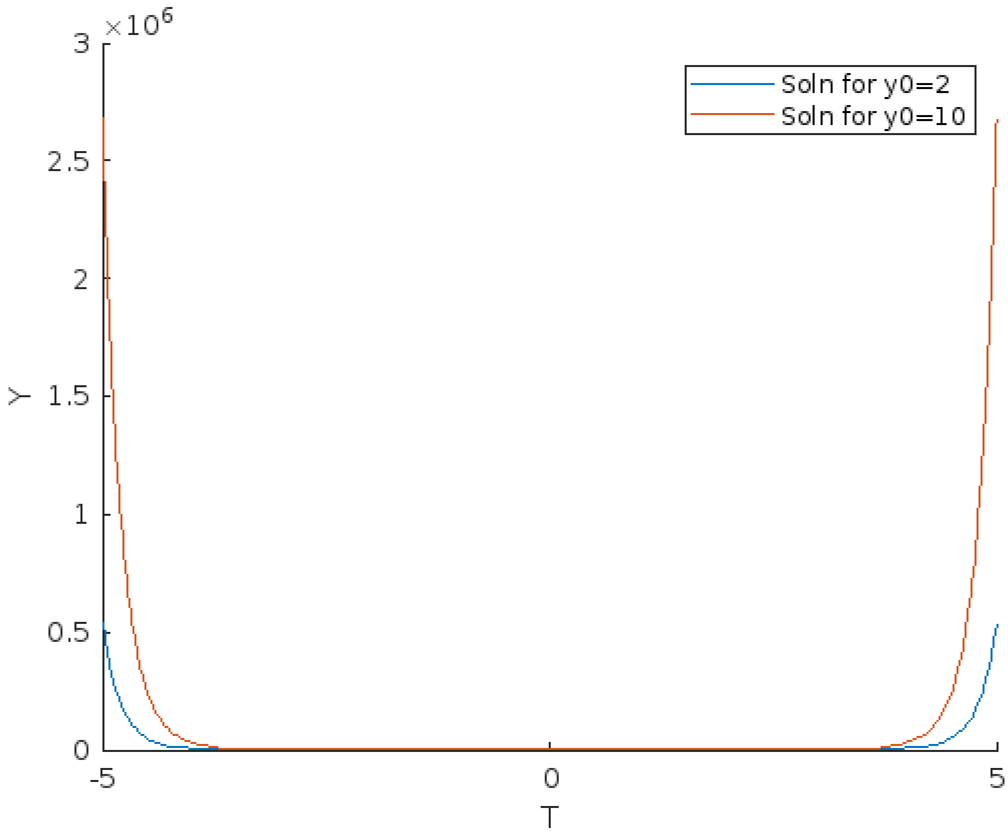
syms y(t);
ode = diff(y, t) == t*y;
cond = y(0) == 2;
ySol = dsolve(ode, cond);

cond1 = y(0) == 10;
ySol1 = dsolve(ode, cond1);

% Plot in terminal

hold on
fplot(ySol)
fplot(ySol1)
legend('Soln for y0=2', 'Soln for y0=10')
xlabel('T')
ylabel('Y')


% Clear the variables in environment
% clear all
% Clear outputs
% clc
```



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% HOMOGENEOUS SYSTEM OF FIRST ORDER ODE

% B Niranjan
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% Roll : 21124015
% 4th October 2023

syms v(t) u(t)

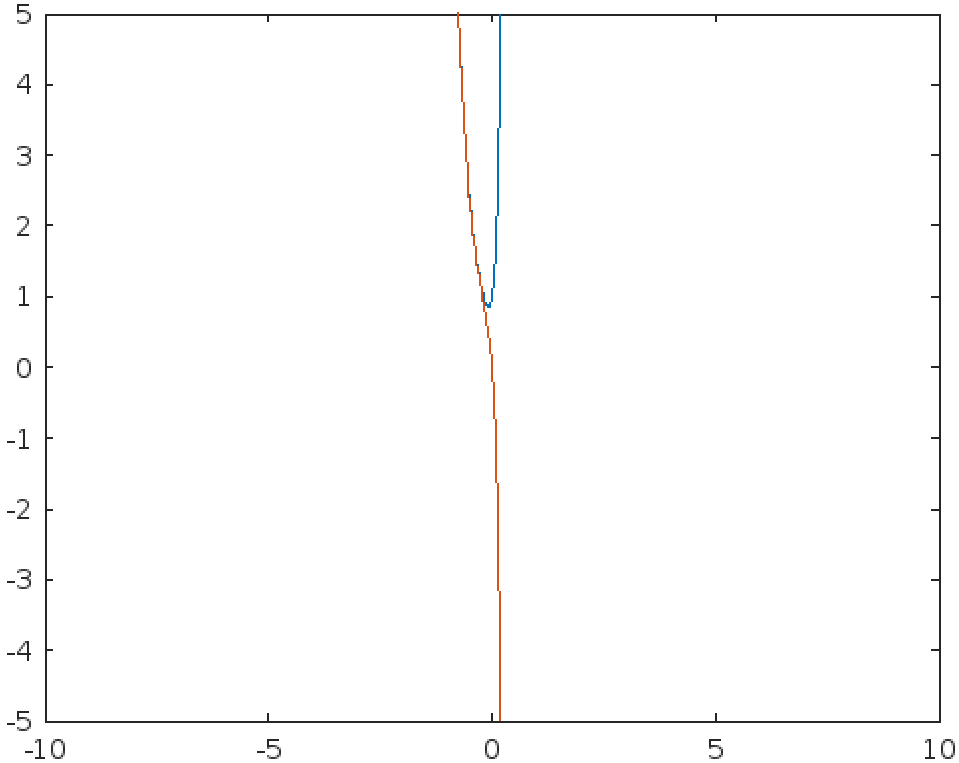
ode1 = diff(u,t) == 4*u - 7*v;
ode2 = diff(v,t) == -8*u + 5*v;
odes = [ode1, ode2];

c1 = u(0) == 1;
c2 = v(0) == 0;
conds = [c1,c2];

% s = dsolve(odes);
% uSol(t) = s.u;
% vSol(t) = s.v;

[uSol(t), vSol(t)] = dsolve(odes);
[usol(t), vsol(t)] = dsolve(odes, conds);

fplot(usol);
hold on
fplot(vsol);
% legend('usol', 'vsol');
xlim([-10 10]);
ylim([-5 5]);
```



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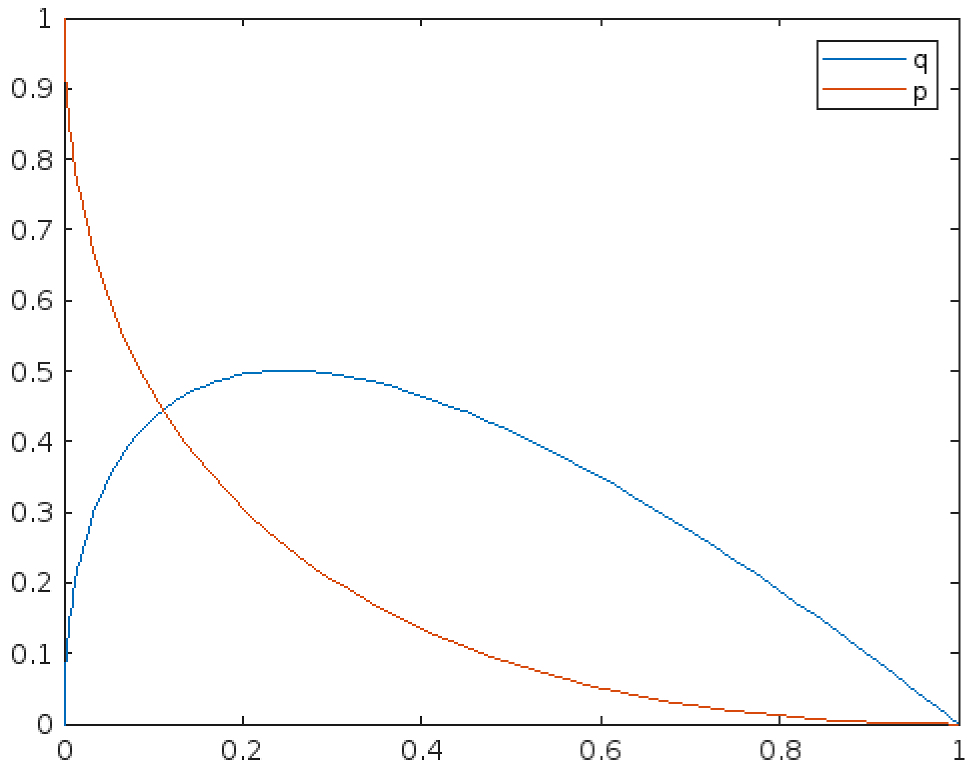
```
% HARDY-WEINBURG THEOREM

% B Niranjan
% IDD M&C Part 3
% Roll : 21124015
% 4th October 2023

syms r
p(r) = (1-r^0.5)^2;
q(r) = 2 * r^0.5 * (1 - r^0.5);

fplot(q, [0,1])
hold on
fplot(p, [0,1])
legend('q', 'p')
```



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```
% DOMAR'S MACRO MODEL

% B Niranjan
% IDD M&C Part 3
% Roll : 21124015
% 11th October 2023

syms t s(t) i(t) y(t);

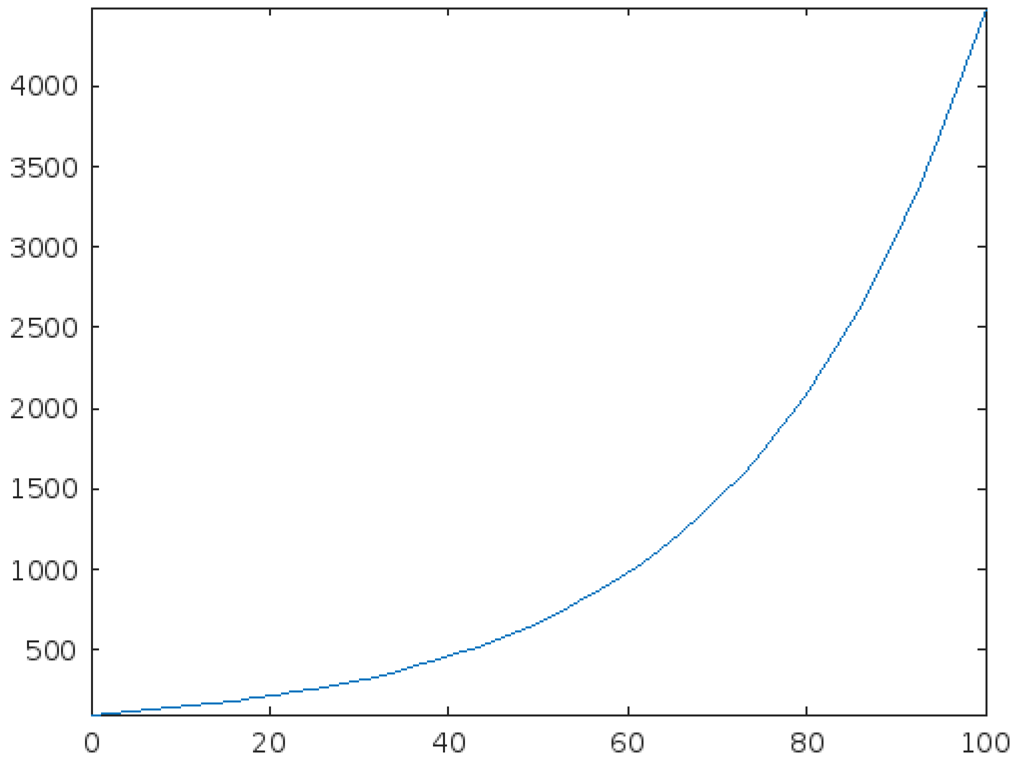
% a: proportion of national income
% b: factor of y'

a = 0.035;
b = 0.92;

eqn1 = s == a*y;
eqn2 = i == b*diff(y,t);
eqn3 = s == i;

% s == i, eliminate redundant eqns
ode(t) = a*y == b*diff(y,t);
c1 = y(0) == 100;

y = dsolve(ode, c1);
fplot(y, [0, 100])
```



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% DOMAR FIRST DEBT MODEL

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% IDD M&C Part 3
% Roll : 21124015
% 11th October 2023

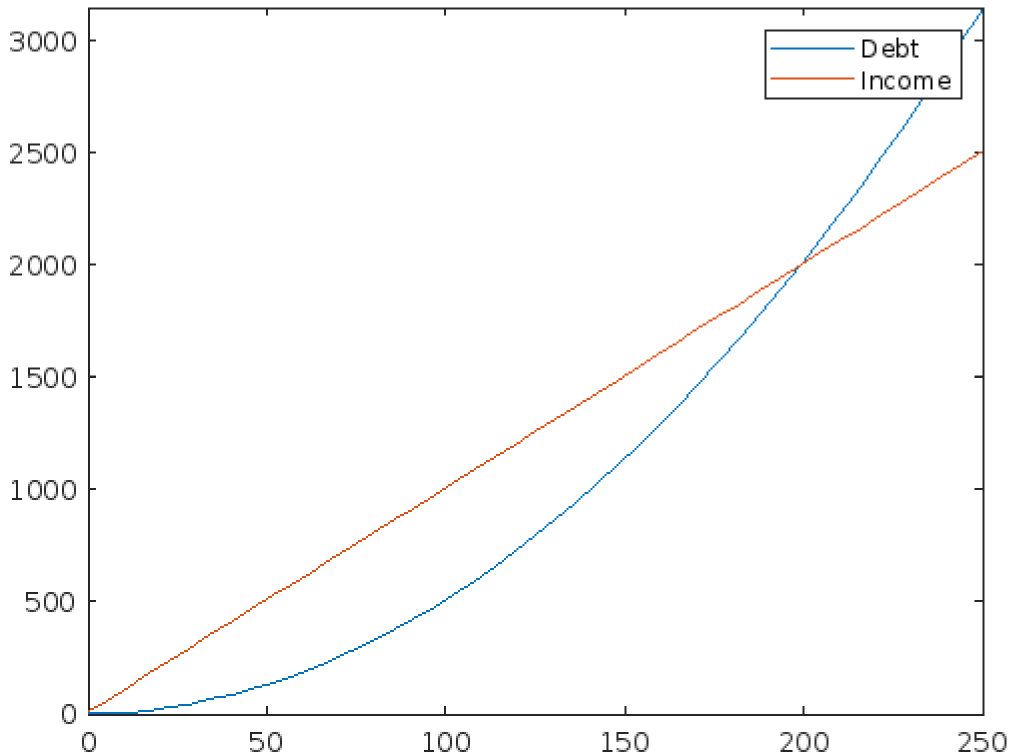
syms t d(t) y(t);
a = 0.01;
b = 10;

eqn2 = diff(d,t) == a*y;
eqn1 = diff(y,t) == b;

odes = [eqn1, eqn2];
c1 = d(0) == 1;
c2 = y(0) == 10;

soln = dsolve(odes, [c1, c2]);
d = soln.d;
y = soln.y;

fplot(d);
hold on
fplot(y);
xlim([0,250]);
legend("Debt", "Income");
```



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```
% DOMAR'S SECOND DEBT MODEL

% B Niranjan
% IDD M&C Part 3
% Roll : 21124015
% 11th October 2023

syms t y(t) d(t);

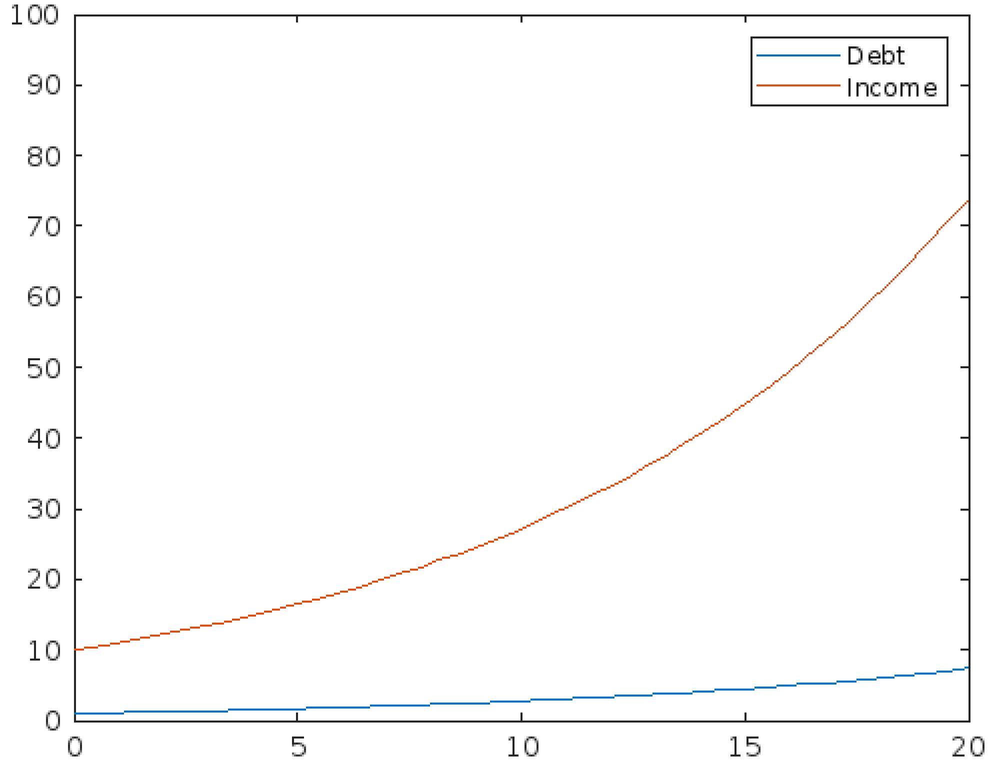
a = 0.01;
b = 0.1;

eqn1 = diff(y,t) == b*y;
eqn2 = diff(d,t) == a*y;

odes = [eqn1, eqn2];
c1 = d(0) == 1;
c2 = y(0) == 10;

soln = dsolve(odes, [c1, c2]);
d = soln.d;
y = soln.y;

fplot(d);
hold on
fplot(y);
xlim([0,20]);
ylim([0,100]);
legend("Debt", "Income");
```



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% ALLEN'S SPECULATIVE MODEL

% B Niranjan
% IDD M&C Part 3
% Roll : 21124015
% 11th October 2023

% display format
format shortEng;

% DEBT, PRICE AND SUPPLY
syms t p(t) d(t) s(t);

a0 = 0.5684;
a1 = -.5137;
a2 = 0.5874;

b0 = 0.5478;
b1 = 0.5712;
b2 = -.5932;

% DEMAND == SUPPLY FOR EQUILIBRIUM
% eliminate redundancy
eqn = a0 + a1*p + a2*diff(p,t) == b0 + b1*p + b2*diff(p,t);
cnd = p(0) == 10;


p(t) = dsolve(eqn, cnd);
d(t) = a0 + a1*p + a2*diff(p,t);
s(t) = b0 + b1*p + b2*diff(p,t);

fplot(p);
hold on
fplot(d);
legend("Price", "Demand=Supply");

p
d
s
```

```
p(t) =

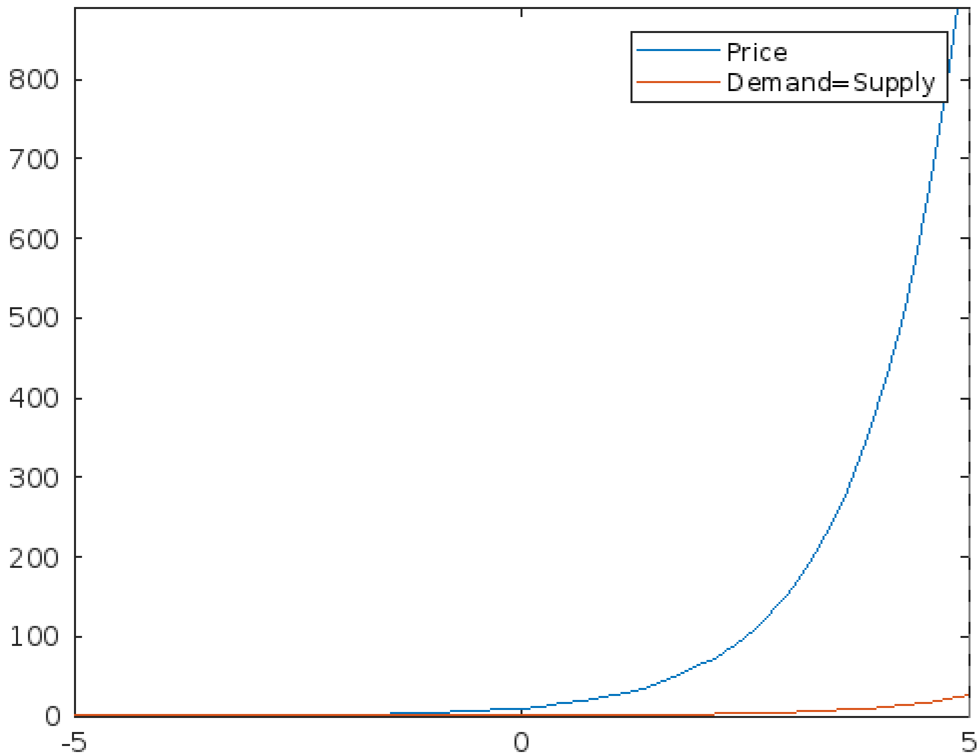
(108284*exp((10849*t)/11806))/10849 + 206/10849


d(t) =

(20841989971*exp((10849*t)/11806))/80052058750 + 30303747/54245000


s(t) =
```

```
(20841989971*exp((10849*t)/11806))/80052058750 + 30303747/54245000
```



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```
% RICHARDSON'S ARMS RACE MODEL
% 01 November 2023

syms t x(t) y(t);

% X is arms expenditure of A
% Y is arms expenditure of B

% mn - ab > 0 for stable equilibrium
% Initially, both countries spend at same rate

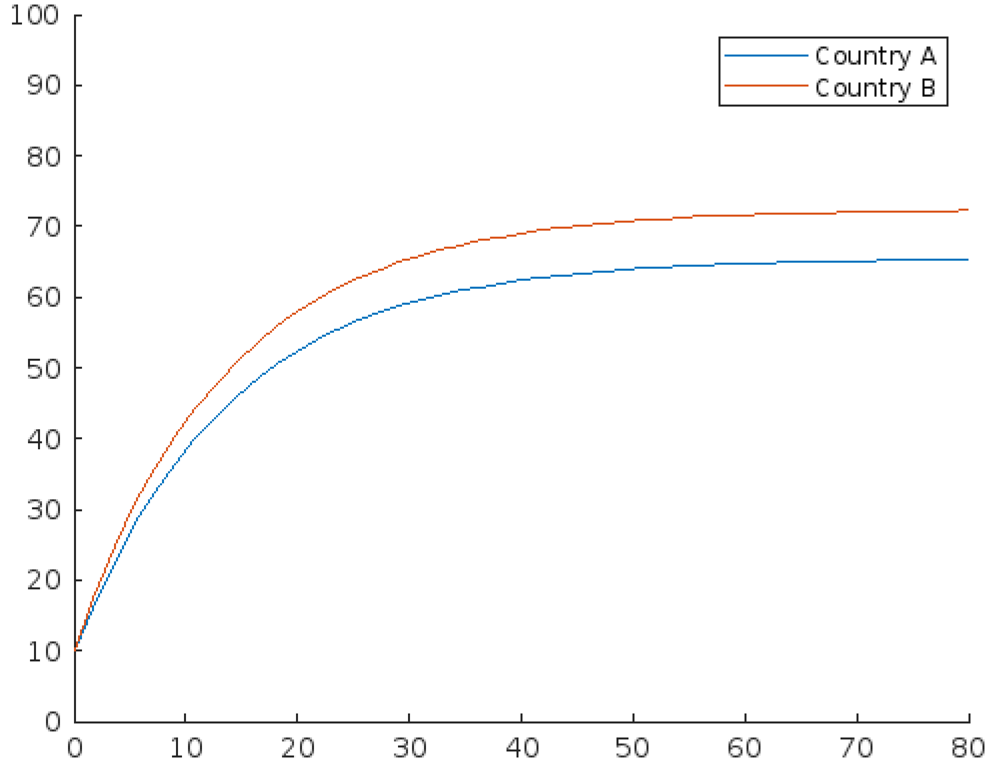
a = 1.24; b = 1.43;
m = 1.45; n = 1.36;
r = 5.1; s = 4.9;

eq1 = diff(x, t) == a*y - m*x + r;
eq2 = diff(y, t) == b*x - n*y + s;

% Initially Both countries had same budget
c1 = x(0) == 10;
c2 = y(0) == 10;

soln = dsolve([eq1, eq2], [c1, c2]);

% Plot x,y separately
hold on
fplot(soln.x); fplot(soln.y);
xlim([0,80]); ylim([0,100]);
legend("Country A", "Country B");
```



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