```
% Christopher Brant
% C19816588
% MATLAB Homework 5B Due on 11/15/17

clear; clc; close all;

% a, b, c, and d denote the four leftmost nonzero digits of my student
 ID
% second value of 1 is skipped
a = 1;
b = 9;
c = 8;
d = 6;

% Laplace Numerator polynomials are denoted as L_Nx
% Laplace Denominator polynomials are denoted as L_Dx
L_N1 = [1,0];
L_N2 = [1,a];
L_N3 = [1,2*b,b^2];
L_D1 = [1,3*c,3*(c^2),c^3];
L_D2 = [1,d];

% L_Num and L_Den denote the Laplace transform numerator and
 denominator
L_N12 = conv(L_N1,L_N2);
L_Num = conv(L_N12,L_N3);
L_Den = conv(L_D1,L_D2);

% [r_L,p_L,k_L] will denote the Laplace transform in question 1
[r_L,p_L,k_L] = residue(L_Num, L_Den);

% Print out residue results for the Laplace transform
fprintf('The following are Laplace Transform values\n');
for i=1:4
    fprintf('Value %0.0f of r is %0.2f\n', i, r_L(i));
    fprintf('Value %0.0f of p is %0.2f\n', i, p_L(i));
end

fprintf('Values of k are ');
fprintf('%0.1f ', k_L);
fprintf('\n');

% Print out the format of the partial fraction expansion
fprintf('The partial fraction expansion is as follows:\n');
fprintf('(%0.2f/(s-(%0.2f)))', r_L(1), p_L(1));
fprintf('+(%0.2f/(s-(%0.2f))^2)', r_L(2), p_L(2));
fprintf('+(%0.2f/(s-(%0.2f))^3)\n', r_L(3), p_L(3));
fprintf('+(%0.2f/(s-(%0.2f)))', r_L(4), p_L(4));
fprintf('+ %0.1f\n\n', k_L);

% When this prints, underneath write the time domain equation
 necessary
```

```
fprintf('For ROC Real{s} > -min{c,d},\n');
fprintf('Time domain function is as follows:\n');
fprintf('[(%0.2f)+(%0.2f)(t)+(%0.2f)(t^2)](e^(-8t))u(t) ',...
    r_L(1),r_L(2),r_L(3));
fprintf('+ %0.2f(e^(-6t))u(t) + (%0.2f)\x3b4(t)\n\n', r_L(4), k_L);

% Z_Nx and Z_Dx denote the terms of the Z transform
Z_N1 = [-(a^3)/1000,3*(a^2/100),-3*(a/10),1];
Z_N2 = [-(b^3)/1000,3*(b^2/100),-3*(b/10),1];
Z_D1 = [-(c^3)/1000,3*(c^2/100),-3*(c/10),1];
Z_D2 = [-d/10,1];

% Z_Num and Z_Den denote the Z transform numerator and denominator
Z_Num = conv(Z_N1,Z_N2);
Z_Den = conv(Z_D1,Z_D2);

% [r_Z,p_Z,k_Z] will denote the Z transform in question 3
[r_Z,p_Z,k_Z] = residue(Z_Num, Z_Den);

% Print out residue results for the Z transform
fprintf('The following are Z transform values\n');
for i=1:4
    fprintf('Value %0.0f of r is %0.2f\n', i, r_Z(i));
    fprintf('Value %0.0f of p is %0.2f\n', i, p_Z(i));
end

fprintf('Values of k are ');
fprintf('%0.4f ', k_Z);
fprintf('\n');

% Print out the format of the partial fraction expansion
r_Z_divp = r_Z ./ p_Z;
p_Z_div1 = 1 ./ p_Z;
fprintf('The partial fraction expansion is as follows:\n');
fprintf('(%0.2f/(1-(%0.2f)(z^(-1))))', r_Z_divp(1), p_Z_div1(1));
fprintf('+(%0.2f/(1-(%0.2f)(z^(-1))))', r_Z_divp(2), p_Z_div1(2));
fprintf('+(%0.2f/(1-(%0.2f)(z^(-1)))^2)\n', r_Z_divp(3), p_Z_div1(3));
fprintf('+(%0.2f/(1-(%0.2f)(z^(-1))^3)', r_Z_divp(4), p_Z_div1(4));
fprintf('+(%0.4f)z^(-2)', k_Z(1));
fprintf('+(%0.4f)z^(-1)', k_Z(2));
fprintf('+(%0.4f)', k_Z(3));
fprintf('\n\n');

% When this prints, underneath write the time domain equation
 necessary
fprintf('For ROC |z| > (max{c,d})/10,\n');
fprintf('Time domain function is as follows:\n');
fprintf('(%0.2f)((%0.2f)^n)u[n]', r_Z_divp(1), p_Z_div1(1));
fprintf('+(%0.2f)((%0.2f)^n)u[n]\n', r_Z_divp(2), p_Z_div1(2));
fprintf('+(%0.2f)(n+1)((%0.2f)^n)u[n]', r_Z_divp(3), p_Z_div1(3));
fprintf('+(%0.2f)(((n+1)(n+2))/2)
((%0.2f)^n)u[n]\n',r_Z_divp(4),p_Z_div1(4));
fprintf('+(%0.4f)\x3b4[n-2]', k_Z(1));
fprintf('+(%0.4f)\x3b4[n-1]', k_Z(2));
```

```
fprintf('+(%0.4f)\x3b4[n]\n\n', k_Z(3));

fprintf('There is a known error when printing, the delta becomes a
 #');
```

```
The following are Laplace Transform values
Value 1 of r is -44.75
Value 1 of p is -8.00
Value 2 of r is -62.50
Value 2 of p is -8.00
Value 3 of r is -28.00
Value 3 of p is -8.00
Value 4 of r is 33.75
Value 4 of p is -6.00
Values of k are 1.0
The partial fraction expansion is as follows:
(-44.75/(s-(-8.00)))+(-62.50/(s-(-8.00))^2)+(-28.00/(s-(-8.00))^3)
+(33.75/(s-(-6.00)))+ 1.0

For ROC Real{s} > -min{c,d},
Time domain function is as follows:
[(-44.75)+(-62.50)(t)+(-28.00)(t^2)](e^(-8t))u(t) + 33.75(e^(-6t))u(t)
 + (1.00)#(t)

The following are Z transform values
Value 1 of r is -3.26
Value 1 of p is 1.67
Value 2 of r is 2.09
Value 2 of p is 1.25
Value 3 of r is 0.24
Value 3 of p is 1.25
Value 4 of r is 0.01
Value 4 of p is 1.25
Values of k are 0.0024 -0.0662 0.5732
The partial fraction expansion is as follows:
(-1.95/(1-(0.60)(z^(-1))))+(1.68/(1-(0.80)(z^(-1))))+(0.19/(1-(0.80)
(z^(-1)))^2)
+(0.01/(1-(0.80)(z^(-1))^3)+(0.0024)z^(-2)+(-0.0662)z^(-1)+(0.5732)

For ROC |z| > (max{c,d})/10,
Time domain function is as follows:
(-1.95)((0.60)^n)u[n]+(1.68)((0.80)^n)u[n]
+(0.19)(n+1)((0.80)^n)u[n]+(0.01)(((n+1)(n+2))/2)((0.80)^n)u[n]
+(0.0024)#[n-2]+(-0.0662)#[n-1]+(0.5732)#[n]

There is a known error when printing, the delta becomes a #
```

*Published with MATLAB® R2015a*