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% Ch 4. Assignment #10 due 11/14
clear, clc
Date = date

Date =

21-Nov-2007

Problem 28

```
% Find: t.
% Given: Amount (A) = 1000000, Principal (P) = 10000, and rate (r) = 6%.

% For each additional year the amount in the account is given by:
% A = (A + 10000) + (A + 10000)*r, which simplifies into:
% A = (A + 10000)*(1 + r)

P = 10000; , r = 0.06;
% initialize A and t.
A = 0; , t = 0;

while A < 1000000
    A = (A + 10000)*(1 + r);
    t = t + 1;
end % A < 1000000

number_of_years = t
```

number_of_years =

33

Problem 31a

% Find: values of v_2 such that i_1, i_2, i_3, i_4, & i_5 <= .001.

% Given:

```
% eqn. #1: -v_1 + R_1*i_1 + R_4*i_4 = 0
% eqn. #2: -R_4*i_4 + R_2*i_2 + R_5*i_5 = 0
% eqn. #3: -R_5*i_5 + R_3*i_3 + v_2 = 0
% eqn. #4: i_1 = i_2 + i_4
% eqn. #5: i_2 = i_3 + i_5
```

% Substitute equations #4 and #5 into #1, #2, and #3:

```
% #1: (R_1 + R_4)*i_1 - R_4*i_2 + 0*i_3 = v_1
% #2: -R_4*i_1 + (R_2 + R_4 + R_5)*i_2 - R_5*i_3 = 0
% #3: 0*i_1 + R_5*i_2 - (R_3 + R_5)*i_3 = v_2
% #4: i_4 = i_1 - i_2
% #5: i_5 = i_2 - i_3
```

```

% Given resistor values:
R_1 = 5000; R_2 = 100000; R_3 = 200000; R_4 = 150000; R_5 = 250000;
v_1 = 100;

Matrix = [(R_1 + R_4), -R_4, 0, -R_4, (R_2 + R_4 + R_5), -R_5; ...
          0, R_5, -(R_3 + R_5)];

% Initiate current matrix and v_2.
current = [0; 0; 0; 0; 0];
v_2 = 100;
good_value_of_v_1 = 0;

while abs(current) <= 0.001*[1; 1; 1; 1; 1]
    b = [v_1; 0; v_2];
    i_1to3 = Matrix^(-1)*b;
    current=[i_1to3; i_1to3(1) - i_1to3(2); i_1to3(2) - i_1to3(3)];

    if abs(current)<=.001*[1; 1; 1; 1; 1]
        good_value_of_v_1 = v_2;
    end % abs(current)<=.001*[1; 1; 1; 1; 1]

    v_2 = v_2 - 0.01;
    if v_2 < 0
        break
    end % v_2 < 0

end % abs(current) <= 0.001*[1; 1; 1; 1; 1]

v_2_ranges_from_0_to = good_value_of_v_1
b = [v_1; 0; v_2];
i_1to3 = Matrix^(-1)*b;
current_at_v_2 = [i_1to3; i_1to3(1) - i_1to3(2); i_1to3(2) - i_1to3(3)]

v_2_ranges_from_0_to =
    31.6700

current_at_v_2 =
    0.0010
    0.0004
    0.0001
    0.0006
    0.0002

```

Problem 33

```

% For Table:
% rows 1 through 3 represent the pass (there are only three passes!).
% columns 1 through 4 represent the variable being considered (k, b, x, and
% y respectively).

Table = [1, -2, -1, -2; 2, -2, 0, -2; 3, -3, 1, -3]

% Test answers in table

k = 1; b = -2; x = -1; y = -2;
while k<= 3
    k_b_x_y = [k, b, x, y] %I made this a vector because it is easier to see.
    y = x^2 - 3;
    if y < b
        b = y;
    end
    x = x + 1;
    k = k + 1;
end

```

Table =

1	-2	-1	-2
2	-2	0	-2
3	-3	1	-3

k_b_x_y =

1	-2	-1	-2
---	----	----	----

k_b_x_y =

2	-2	0	-2
---	----	---	----

k_b_x_y =

3	-3	1	-3
---	----	---	----

Problem 35

```
% This program computes the force necessary to push an object along a  
% surface given the objects weight (W) and the composition of the  
% materials, (the object and the surface).
```

```
% User input:
```

```
W = input('Weight: ');
```

```
Material = input('choose material (metal on metal, wood on wood, metal on wood,  
rubber on concrete): ','s');
```

```
%
```

```
switch Material
```

```
case 'metal on metal'
```

```
mu = 0.20;
```

```
Pushing_force = mu*W
```

```
case 'wood on wood'
```

```
mu = 0.35;
```

```
Pushing_force = mu*W
```

```
case 'metal on wood'
```

```
mu = 0.40;
```

```
Pushing_force = mu*W
```

```
case 'rubber on concrete'
```

```
mu = 0.70;
```

```
Pushing_force = mu*W
```

```
otherwise
```

```
display('Please choose only the four material combinations listed, order and  
spelling matter.')
```

```
end % Material
```

Weight: 100

choose material (metal on metal, wood on wood, metal on wood, rubber on concrete): >>

metal on metal

Pushing_force =

20

Weight: 50

choose material (metal on metal, wood on wood, metal on wood, rubber on concrete): >>

metal on metal

Pushing_force =

10

Weight: 80

choose material (metal on metal, wood on wood, metal on wood, rubber on concrete): >>
metal on rubber

Please choose only the four material combinations listed, order and spelling matter.

Problem 38

```
% This program computes the pressure exerted by a volume of gas.
% For volume_temperature(V, T)

% Input variables:
% T = temperature in Kelvins (K).
% V = gas specific volume (L/mol).
% Gas = Helium (He), Hydrogen (H_2), Oxygen (O_2), Chlorine (Cl_2), Carbon
% dioxide (CO_2).

% Output variables:
% Pressure (atm)

volume_temperature(20, 300);
```

Type He, H_2, O_2, Cl_2, or CO_2: Cl_2

Pressure_in_atm =

1.2181

```
%% Function for Ch4 problem #38
```

```
function Pressure = volume_temperature(V,T)
```

```
% constant:
R = 0.08206;
```

```
a = 0;
while a == 0
```

```
Gas = input('Type He, H_2, O_2, Cl_2, or CO_2: ', 's');
```

```
switch Gas
    case 'He'
        a = 0.0341; b = 0.0237;
    case 'H_2'
        a = 0.244; b = 0.0266;
    case 'O_2'
```

```
        a = 1.36; b = 0.0318;
    case 'Cl_2'
        a = 6.49; b = 0.0562;
    case 'CO_2'
        a = 3.59; b = 0.0427;
    otherwise
        disp('please choose a valid chemical formula')
    end % Gas
end % a = 0, b = 0
```

Pressure_in_atm = (R*T)/(V - b) - a/(V^2)