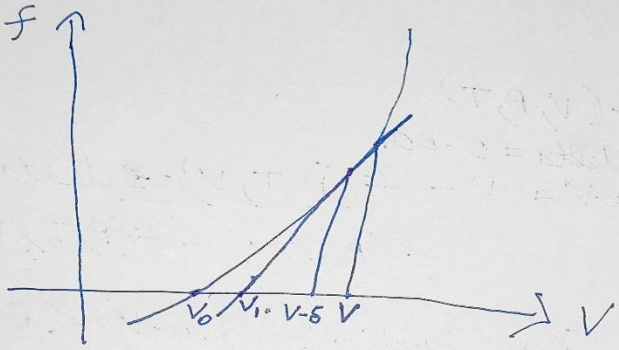
Problem 1

Problem Statement: To draw P-V graph for real gas equation for a pressure range of 1–10 atm & const. Temperature = 345 K

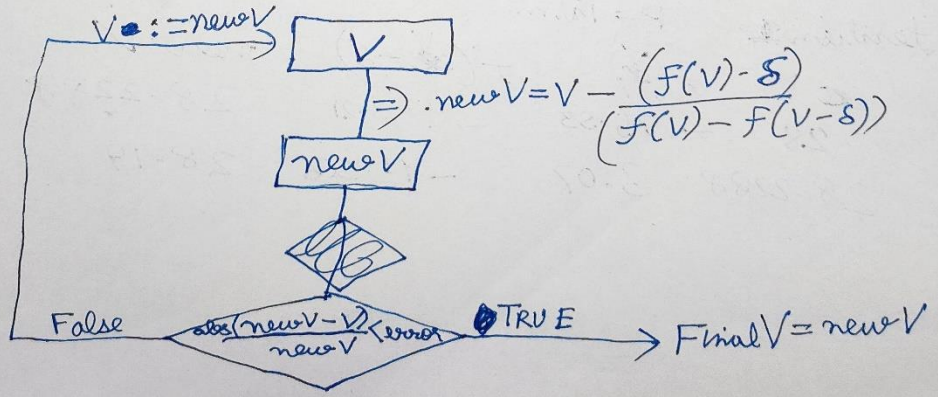
Modified Secant Method $f(V) = PV^3 - V^2(Pb + RT) + aV - ab$



$newV = V_1$

$newV = V_1 = V - \frac{(f(V)\cdot\delta)}{(f(V) - f(V-\delta))}$

Using recursion to get the solution of $f(V) = 0$ For constant P & T



file : f.m

f(P, T, V)

a = 3.592

b = 0.04267

R = 0.082056

return $PV^3 - (Pb+RT)V^2 + aV - ab$

file algo.m

algo(V, P, T)

delta = 0.001

$$newV = V - \frac{f(P,T,V)\cdot delta}{f(P,T,V) - f(P,T,V-delta)}$$

if (abs((newV − V)/newV) < 0.001)

return newV

else

return algo(newV, P, T)

Iterations P = 1atm

V	f(V)	f(V−δ)	newV
28	−175.53	−183.21	28.2288
28.2288	3.07	−4.8506	28.19

MATLAB CODE

<f.m>

```
function val = f(P,T,V)
    a = 3.592;
    b = 0.04267;
    R = 0.082056;
    val = P*V^3 - (P*b+R*T)*V^2 +a*V -a*b;
return
end
```

<algo.m>

```
function result = algo(V,P,T)
delta = 0.01;
newV = V - (f(P,T,V)*delta)/(f(P,T,V)-f(P,T,V-delta));

if abs((newV- V)/newV) <= 0.00001
    result = newV;
    return
else
    result = algo(newV,P,T);
    return
end
```

<main.m>

```
P = 1:1:100;
V = P;
T=345;
```

```
v1 = input("guess number");
for i =P
   V(i)= algo(v1,P(i),T);
end
V
plot(P,V)
```