> (* Mantej Sokhi *)

QUESTION 4:

> restart:
> MAKEMONIC := proc(paramA::polynom,paramB::polynom)

```
  local n,d,LCF:
  n := paramA:
  d := paramB:
  LCF := lcoeff(d):

  if whattype(LCF)='integer' then:
     if LCF=1 then:
         return (n,d):
      else:
         n := expand((1/LCF)*n):
          d  := expand((1/LCF)*d):
          return (n,d):
       fi:
  elif whattype(LCF)='fraction' then:
     LCF := denom(LCF)/numer(LCF):
      n := expand(LCF*n):
     d := expand(LCF*d):
      return (n,d):
  fi:

  end proc:
```

> RATRECON := proc(paramA::polynom,paramB::polynom,paramC::integer,
  paramD::posint)

```
  local R,Q,T,N,DD,k,i,M,P,num,dNum:

  R := table():
  Q := table():
  T := table():
  N := paramC:
  DD := paramD:
  k := 1:
  M := paramA:
  P := paramB:
  R[k] := M:
  R[k+1] := P:
```

```
   Q[k] := 0:
   Q[k+1] := 0:
   T[k] := 0:
   T[k+1] := 1:
   flag=false:


   while R[k+1]<>0 do:
      Q[k+2] := expand(quo(R[k],R[k+1],x,'r')):
       R[k+2] := r:
      T[k+2] := expand(T[k]-(Q[k+2]*T[k+1])):

      if gcd(T[k+2],M)=1 and degree(M,x)=(N+DD+1) then:
         if degree(R[k+2],x)=N then:
              flag=true:
               break:
            fi:
       else:
           flag=false:
           return "FAIL":
        fi:
       k++:

   od:

   if flag=false then:
       return "FAIL":
   fi:

   R := convert(R,list):
   Q := convert(Q,list):
   T := convert(T,list):

   num,dNum := MAKEMONIC(R[k+2],T[k+2]):
   return (num/dNum):
   end proc:
> (* Inputs: *)

   P := expand(((1/180)*x^4)-((5/63)*x^3)+((97/252)*x^2)-((65/126)*
   x)+(74/105)):
   M := expand((x-1)*(x-2)*(x-3)*(x-4)*(x-5)):
   N := 2:
```

```
DD:= 2:
P;
M;
```

$$\frac{1}{180}\,x^4 - \frac{5}{63}\,x^3 + \frac{97}{252}\,x^2 - \frac{65}{126}\,x + \frac{74}{105}$$

$$x^5 - 15\,x^4 + 85\,x^3 - 225\,x^2 + 274\,x - 120 \tag{1}$$

```
> (* Assuming we know N=degree(n,x) and D=degree(d,x) *)

res1 := RATRECON(M,P,N,DD):
res1;
```

$$\frac{2\,x^2 - 3\,x + 4}{x^2 + 5} \tag{2}$$

```
> mapRat := ratrecon(P,M,x,2,2):
mapRat;
```

$$\frac{2\,x^2 - 3\,x + 4}{x^2 + 5} \tag{3}$$