```
> eq1 := 0 = (1-q1-q2)*PI-beta*X*T-n*X;
     eq2 := 0 = q1*PI + beta*X*T - (n+w)*E;
     eq3 := 0 = q2*PI + (1-p)*w*E - (n+v)*L;
     eq4 := 0 = p*w*E+v*L-(n+a+d)*T;
                                    eq1 := 0 = (1 - q1 - q2) \Pi - \beta XT - nX
                                        eq2 := 0 = q1 \Pi + \beta XT - (n + w) E
                                    eq3 := 0 = q2 \Pi + (1 - p) w E - (n + v) L
                                      eq4 := 0 = p w E + v L - (n + a + d) T
                                                                                                                                (1)
> sols := solve( {eq1,eq2,eq3,eq4},{X,E,L,T}):
 > sols[3];
 T = RootOf((a \beta n^2 + a \beta n v + a \beta n w + a \beta v w + \beta d n^2 + \beta d n v + \beta d n w + \beta d v w + \beta n^3) (2)
       +\beta n^{2}v + \beta n^{2}w + \beta n v w) Z^{2} + (\Pi \beta n p q^{2}w - \Pi \beta n p w - \Pi \beta n q^{2}v - \Pi \beta v w)
       + a n^3 + a n^2 v + a n^2 w + a n v w + d n^3 + d n^2 v + d n^2 w + d n v w + n^4 + n^3 v + n^3 w
       + n^2 v w) Z - \prod n^2 p \, q 1 \, w - \prod n^2 q 2 \, v - \prod n \, q 1 \, v \, w - \prod n \, q 2 \, v \, w)
> T2 := convert(sols[3],radical);
 T2 := T = \left( -\Pi \beta n p q^2 w + \Pi \beta n p w + \Pi \beta n q^2 v + \Pi \beta v w - a n^3 - a n^2 v - a n^2 w \right)
       -a n v w - d n^3 - d n^2 v - d n^2 w - d n v w - n^4 - n^3 v - n^3 w - n^2 v w
       + (\Pi^2 \beta^2 n^2 p^2 q^2 w^2 - 2 \Pi^2 \beta^2 n^2 p^2 q^2 w^2 - 2 \Pi^2 \beta^2 n^2 p q^2 v w + \Pi^2 \beta^2 n^2 p^2 w^2 + 2 \Pi^2 \beta^2 n^2 p q^2 v w +
       + 2 \Pi a \beta n^{3} p q^{2} v w + 2 \Pi a \beta n^{3} p q^{2} w^{2} + 4 \Pi a \beta n^{2} p q^{2} v w^{2} + 2 \Pi a \beta n^{2} p q^{2} v w^{2}
       +4 \Pi \beta d n^4 p q l w + 2 \Pi \beta d n^4 p q 2 w + 4 \Pi \beta d n^3 p q l v w + 4 \Pi \beta d n^3 p q l w^2
       + 2 \Pi \beta d n^{3} p q^{2} v w + 2 \Pi \beta d n^{3} p q^{2} w^{2} + 4 \Pi \beta d n^{2} p q^{2} v w^{2} + 2 \Pi \beta d n^{2} p q^{2} v w^{2}
       + 4 \Pi \beta n^5 p q l w + 2 \Pi \beta n^5 p q 2 w + 4 \Pi \beta n^4 p q l v w + 4 \Pi \beta n^4 p q l w^2
       + 2 \Pi \beta n^4 p q^2 v w + 2 \Pi \beta n^4 p q^2 w^2 + 4 \Pi \beta n^3 p q^2 v w^2 + 2 \Pi \beta n^3 p q^2 v w^2
       +2 \Pi^{2} \beta^{2} n p v w^{2} + 2 \Pi^{2} \beta^{2} n q^{2} v^{2} w - 2 \Pi a \beta n^{4} p w + 2 \Pi a \beta n^{4} q^{2} v - 2 \Pi a \beta n^{3} p v w
       -2 \Pi a \beta n^3 p w^2 + 4 \Pi a \beta n^3 q v w + 2 \Pi a \beta n^3 q v^2 + 6 \Pi a \beta n^3 q v w
       -2 \Pi a \beta n^2 p v w^2 + 4 \Pi a \beta n^2 q v^2 w + 4 \Pi a \beta n^2 q v v^2 + 6 \Pi a \beta n^2 q v^2 w
       + 4 \Pi a \beta n^{2} q^{2} v w^{2} + 4 \Pi a \beta n q^{2} v^{2} w^{2} + 4 \Pi a \beta n q^{2} v^{2} w^{2} - 2 \Pi \beta d n^{4} p w
       + 2 \Pi \beta d n^4 q^2 v - 2 \Pi \beta d n^3 p v w - 2 \Pi \beta d n^3 p w^2 + 4 \Pi \beta d n^3 q^2 v w + 2 \Pi \beta d n^3 q^2 v^2
       + 6 \Pi \beta d n^{3} q^{2} v w - 2 \Pi \beta d n^{2} p v w^{2} + 4 \Pi \beta d n^{2} q^{1} v^{2} w + 4 \Pi \beta d n^{2} q^{1} v w^{2}
```

 $+ 6 \Pi \beta d n^2 q^2 v^2 w + 4 \Pi \beta d n^2 q^2 v w^2 + 4 \Pi \beta d n q^2 v^2 w^2 + 4 \Pi \beta d n q^2 v^2 w^2$  $-2 \Pi \beta n^5 p w + 2 \Pi \beta n^5 q^2 v - 2 \Pi \beta n^4 p v w - 2 \Pi \beta n^4 p w^2 + 4 \Pi \beta n^4 q^4 v w$  $+2 \Pi \beta n^4 q^2 v^2 + 6 \Pi \beta n^4 q^2 v w - 2 \Pi \beta n^3 p v w^2 + 4 \Pi \beta n^3 q^2 v^2 w + 4 \Pi \beta n^3 q^2 v^2 w^2$  $+ 6 \Pi \beta n^{3} q^{2} v^{2} w + 4 \Pi \beta n^{3} q^{2} v w^{2} + 4 \Pi \beta n^{2} q^{2} v^{2} w^{2} + 4 \Pi \beta n^{2} q^{2} v^{2} w^{2} + \Pi^{2} \beta^{2} v^{2} w^{2}$  $-2 \Pi a \beta n^3 v w - 2 \Pi a \beta n^2 v^2 w - 2 \Pi a \beta n^2 v w^2 - 2 \Pi a \beta n v^2 w^2 - 2 \Pi \beta d n^3 v w$  $-2 \Pi \beta d n^2 v^2 w - 2 \Pi \beta d n^2 v w^2 - 2 \Pi \beta d n v^2 w^2 - 2 \Pi \beta n^4 v w - 2 \Pi \beta n^3 v^2 w$  $-2 \Pi \beta n^3 v w^2 - 2 \Pi \beta n^2 v^2 w^2 + a^2 n^6 + 2 a^2 n^5 v + 2 a^2 n^5 w + a^2 n^4 v^2 + 4 a^2 n^4 v w$  $+ a^{2} n^{4} w^{2} + 2 a^{2} n^{3} v^{2} w + 2 a^{2} n^{3} v w^{2} + a^{2} n^{2} v^{2} w^{2} + 2 a d n^{6} + 4 a d n^{5} v + 4 a d n^{5} w$  $+ 2 a d n^4 v^2 + 8 a d n^4 v w + 2 a d n^4 w^2 + 4 a d n^3 v^2 w + 4 a d n^3 v w^2 + 2 a d n^2 v^2 w^2$  $+ 2 a n^7 + 4 a n^6 v + 4 a n^6 w + 2 a n^5 v^2 + 8 a n^5 v w + 2 a n^5 w^2 + 4 a n^4 v^2 w + 4 a n^4 v w^2$  $+2an^{3}v^{2}w^{2}+d^{2}n^{6}+2d^{2}n^{5}v+2d^{2}n^{5}w+d^{2}n^{4}v^{2}+4d^{2}n^{4}vw+d^{2}n^{4}w^{2}$  $+2d^{2}n^{3}v^{2}w + 2d^{2}n^{3}v^{2}w^{2} + d^{2}n^{2}v^{2}w^{2} + 2dn^{7} + 4dn^{6}v + 4dn^{6}w + 2dn^{5}v^{2}$  $+ 8 d n^5 v w + 2 d n^5 w^2 + 4 d n^4 v^2 w + 4 d n^4 v w^2 + 2 d n^3 v^2 w^2 + n^8 + 2 n^7 v + 2 n^7 w$  $+ n^6 v^2 + 4 n^6 v w + n^6 w^2 + 2 n^5 v^2 w + 2 n^5 v w^2 + n^4 v^2 w^2$   $/ (2 \beta (a n^2 + a n v)) / (2 \beta (a n^2 + a n v))$  $+ a n w + a v w + d n^{2} + d n v + d n w + d v w + n^{3} + n^{2} v + n^{2} w + n v w)$ 

## > with(CodeGeneration):

> Matlab (T2, resultname="TEST");

TEST = T == (-(PI \* beta \* n \* p \* q2 \* w) + (PI \* beta \* n \* p \* w) + (PI \* beta \* n \* q2 \* v) + (PI \* beta \* v \* w) - (a \* n ^ 3) - (a \* n ^ 2 \* v) - (a \* n ^ 2 \* w) - (a \* n \* v \* w) - (d \* n ^ 3) - (d \* n ^ 2 \* v) - (d \* n ^ 2 \* w) - (d \* n \* v \* w) - (n ^ 4) - (n ^ 3 \* v) - (n ^ 3 \* w) - (n ^ 2 \* v \* w) + sqrt((PI ^ 2 \* beta ^ 2 \* n ^ 2 \* p ^ 2 \* q2 ^ 2 \* w ^ 2 - 2 \* PI ^ 2 \* beta ^ 2 \* n ^ 2 \* p ^ 2 \* q2 \* w ^ 2 - 2 \* PI ^ 2 \* beta ^ 2 \* n ^ 2 \* p ^ 2 \* q2 \* w ^ 2 - 2 \* pI ^ 2 \* beta ^ 2 \* n ^ 2 \* p \* q2 ^ 2 \* v \* w + PI ^ 2 \* beta ^ 2 \* n ^ 2 \* p \* q2 ^ 2 \* v \* w + PI ^ 2 \* beta ^ 2 \* n ^ 2 \* p \* q2 ^ 2 \* v \* w + PI ^ 2 \* p \* q2 \* v \* w + PI ^ 2 \* p \* q2 \* v \* w + PI ^ 2 \* p \* q2 \* v \* w + PI ^ 2 \* p \* q2 \* v \* w + PI ^ 2 \* p \* q2 \* v \* v \* v ^ 2 - 2 \* PI ^ 2 \* beta ^ 2 \* n ^ 4 \* p \* q1 \* w + 2 \* PI \* a \* beta \* n ^ 4 \* p \* q2 \* w + 4 \* PI \* a \* beta \* n ^ 4 \* p \* q1 \* w ^ 2 \* p \* q1 \* v \* w + 4 \* PI \* a \* beta \* n ^ 3 \* p \* q1 \* v \* w + 4 \* PI \* a \* beta \* n ^ 3 \* p \* q1 \* v \* w ^ 2 + 4 \* PI \* a \* beta \* n ^ 3 \* p \* q1 \* v \* w ^ 2 + 4 \* PI \* a \* beta \* n ^ 4 \* p \* q2 \* w + 4 \* PI \* beta \* d \* n ^ 4 \* p \* q2 \* w + 4 \* PI \* be

```
PI * beta * d * n ^ 3 * p * q1 * v * w + 4 * PI * beta * d * n ^ 3 *
p * q1 * w ^ 2 + 2 * PI * beta * d * n ^ 3 * p * q2 * v * w + 2 * PI
* beta * d * n ^ 3 * p * q2 * w ^ 2 + 4 * PI * beta * d * n ^ 2 * p *
q1 * v * w ^ 2 + 2 * PI * beta * d * n ^ 2 * p * q2 * v * w ^ 2 + 4 *
PI * beta * n ^ 5 * p * q1 * w + 2 * PI * beta * n ^ 5 * p * q2 * w +
4 * PI * beta * n ^ 4 * p * q1 * v * w + 4 * PI * beta * n ^ 4 * p *
q1 * w ^ 2 + 2 * PI * beta * n ^ 4 * p * q2 * v * w + 2 * PI * beta *
n^4 * p * q2 * w ^ 2 + 4 * PI * beta * n ^ 3 * p * q1 * v * w ^ 2 +
2 * PI * beta * n ^ 3 * p * q2 * v * w ^ 2 + 2 * PI ^ 2 * beta ^ 2 *
n * p * v * w ^ 2 + 2 * PI ^ 2 * beta ^ 2 * n * q2 * v ^ 2 * w - 2 *
PI * a * beta * n ^ 4 * p * w + 2 * PI * a * beta * n ^ 4 * q2 * v -
2 * PI * a * beta * n ^ 3 * p * v * w - 2 * PI * a * beta * n ^ 3 * p
* w ^ 2 + 4 * PI * a * beta * n ^ 3 * q1 * v * w + 2 * PI * a * beta
* n ^ 3 * q2 * v ^ 2 + 6 * PI * a * beta * n ^ 3 * q2 * v * w - 2 *
PI * a * beta * n ^ 2 * p * v * w ^ 2 + 4 * PI * a * beta * n ^ 2 *
q1 * v ^ 2 * w + 4 * PI * a * beta * n ^ 2 * q1 * v * w ^ 2 + 6 * PI
* a * beta * n ^ 2 * q2 * v ^ 2 * w + 4 * PI * a * beta * n ^ 2 * q2
* v * w ^ 2 + 4 * PI * a * beta * n * q1 * v ^ 2 * w ^ 2 + 4 * PI * a
* beta * n * q2 * v ^ 2 * w ^ 2 - 2 * PI * beta * d * n ^ 4 * p * w +
2 * PI * beta * d * n ^ 4 * q2 * v - 2 * PI * beta * d * n ^ 3 * p *
v * w - 2 * PI * beta * d * n ^ 3 * p * w ^ 2 + 4 * PI * beta * d * n
^ 3 * q1 * v * w + 2 * PI * beta * d * n ^ 3 * q2 * v ^ 2 + 6 * PI *
beta * d * n ^ 3 * q2 * v * w - 2 * PI * beta * d * n ^ 2 * p * v * w
^ 2 + 4 * PI * beta * d * n ^ 2 * q1 * v ^ 2 * w + 4 * PI * beta * d
* n ^ 2 * q1 * v * w ^ 2 + 6 * PI * beta * d * n ^ 2 * q2 * v ^ 2 * w
+ 4 * PI * beta * d * n ^ 2 * q2 * v * w ^ 2 + 4 * PI * beta * d * n
* q1 * v ^ 2 * w ^ 2 + 4 * PI * beta * d * n * q2 * v ^ 2 * w ^ 2 - 2
* PI * beta * n ^ 5 * p * w + 2 * PI * beta * n ^ 5 * q2 * v - 2 * PI
* beta * n ^ 4 * p * v * w - 2 * PI * beta * n ^ 4 * p * w ^ 2 + 4 *
PI * beta * n ^ 4 * q1 * v * w + 2 * PI * beta * n ^ 4 * q2 * v ^ 2 +
6 * PI * beta * n ^ 4 * q2 * v * w - 2 * PI * beta * n ^ 3 * p * v *
w ^ 2 + 4 * PI * beta * n ^ 3 * q1 * v ^ 2 * w + 4 * PI * beta * n ^
3 * q1 * v * w ^ 2 + 6 * PI * beta * n ^ 3 * q2 * v ^ 2 * w + 4 * PI
* beta * n ^ 3 * q2 * v * w ^ 2 + 4 * PI * beta * n ^ 2 * q1 * v ^ 2
* w ^ 2 + 4 * PI * beta * n ^ 2 * q2 * v ^ 2 * w ^ 2 + PI ^ 2 * beta
^ 2 * v ^ 2 * w ^ 2 - 2 * PI * a * beta * n ^ 3 * v * w - 2 * PI * a
* beta * n ^ 2 * v ^ 2 * w - 2 * PI * a * beta * n ^ 2 * v * w ^
2 * PI * a * beta * n * v ^ 2 * w ^ 2 - 2 * PI * beta * d * n ^ 3 * v
* w - 2 * PI * beta * d * n ^ 2 * v ^ 2 * w - 2 * PI * beta * d * n ^
2 * v * w ^ 2 - 2 * PI * beta * d * n * v ^ 2 * w ^ 2 - 2 * PI * beta
* n ^ 4 * v * w - 2 * PI * beta * n ^ 3 * v ^ 2 * w - 2 * PI * beta *
n ^ 3 * v * w ^ 2 - 2 * PI * beta * n ^ 2 * v ^ 2 * w ^ 2 + a ^ 2 * n
^6+2*a^2*n^5*v+2*a^2*n^5*w+a^2*n^4*
    2 + 4 * a ^ 2 * n ^ 4 * v * w + a ^ 2 * n ^ 4 * w ^ 2 +
                                                            2 * a ^
* n ^ 3 * v ^ 2 * w + 2 * a ^ 2 * n ^ 3 * v * w ^ 2 + a ^ 2 *
    2 * w ^ 2 + 2 * a * d * n ^ 6 + 4 * a * d * n ^ 5 * v + 4 * a *
* n ^ 5 * w + 2 * a * d * n ^ 4 * v ^ 2 + 8 * a * d * n ^ 4 * v * w +
   a *
       d * n ^ 4 * w ^ 2 + 4 * a * d * n ^ 3 * v ^
                                                    2 * w + 4 * a *
* n ^ 3 * v * w ^ 2 + 2 * a * d * n ^ 2 * v ^ 2 * w ^ 2 + 2 * a *
       a * n ^ 6 * v + 4 * a * n ^ 6 * w + 2 * a * n ^ 5 * v ^ 2 + 8
7 + 4 *
           * v * w + 2 * a * n ^ 5 * w ^
       ^
          5
                                         2 + 4 * a * n ^ 4 * v ^
      n
                            2 + 2 * a * n ^
w + 4 * a *
           n ^ 4 * v * w ^
                                           3 * v ^ 2 * w ^
                                                            2 + d^{-}
 n ^
      6 + 2 *
             d ^ 2 * n ^ 5 * v + 2 * d ^ 2 * n ^ 5 * w + d ^
                   2 * n ^ 4 * v * w + d ^ 2 * n ^ 4 * w ^
                                                            2 + 2 *
4 * v ^
       2 + 4 * d ^
    2 * n ^
           3 * v ^ 2 * w + 2 * d ^ 2 * n ^ 3 * v * w ^ 2 + d ^
  ^
d
       ^ 2 * w ^ 2 + 2 * d * n ^ 7 + 4 * d * n ^ 6 * v + 4 * d * n ^
  2 * v
   w + 2 * d * n ^ 5 * v ^ 2 + 8 * d * n ^ 5 * v * w + 2 * d * n ^ 5
```

```
 \begin{bmatrix} * & w & ^2 & 2 & + & 4 & * & d & * & n & ^4 & 4 & * & v & ^2 & * & w & + & 4 & * & d & * & n & ^4 & * & v & * & w & ^2 & + & 2 & * & d & * & n & ^4 & * & v & * & w & ^4 & * & v & * & w & ^4 & * & v & * & w & ^4 & * & v & * & w & * & v & * & w & * & v & * & w & * & v & * & w & * & v & * & w & * & v & * & w & * & v & * & w & * & v & * & w & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * & v & * &
```

 $\{x=2-y\}$ 

**(6)**