```
> restart: #1243,1324
> aa:=proc(n,i,j) option remember: local s: if n=1 then return(1):
  fi: if n=2 then if i=1 and j=2 then return(1): fi: if i=2 and j=1
  then return(q): fi: return(0): fi:  if n=3 then if i=1 and j=2
  then return(1): fi: if (i=1 and j=3) or (i=2 and j=1) or (i=2 and
  j=3) or (i=3 and j=1) then return(q): fi: if i=3 and j=2 then
  return(q^2): fi: return(0): fi: if 0<i and i<n-1 and j=i+1 then
  s:=aa(n-1,i,i+1)+add(add(add(q^(c+1)*binomial(i-1-a,c)*aa(n-2-c,a,
  b),c=0..i-b),b=a+1..i),a=1..i-1): return(simplify(s)): fi: if
  2<i+2 and i+1<j and j<n then
  s:=aa(n-1,i,j)+add(add(q^(c+1)*binomial(i-1-a,c)*aa(n-2-c,a,j-1-c)
  ,c=0..i-1-a),a=1..i-1): return(simplify(s)): fi: if 0<i and i<n
  and j=n then
  s:=add(aa(n-1,i,kk),kk=1..i-1)+q*add(aa(n-1,i,kk),kk=i+1..n-1):
  return(simplify(s)): fi: if 0<j and j<i and i<n+1 then
  return(simplify(q*add(aa(n-1,j,kk),kk=1..n-1))): fi: return(0):
  end:
> NN:=14:
> AA:=(x,v,w)->add(add(add(aa(n,i,j)*x^n*v^i*w^j,j=1..n),i=1..n),n=2
  ..NN):
  AAN:=(x,v,w)->add(add(add(aa(n,i,j)*x^n*v^i*w^j,j=1..i-1),i=1..n),
  n=2..NN):
  AAP:=(x,v,w)->add(add(add(aa(n,i,j)*x^n*v^i*w^j,j=i+1..n),i=1..n-1
  ),n=2..NN):
  CC:=(x,v)->add(add(aa(n,i,i+1)*x^n*v^i,i=1..n-1),n=3..NN):
> AAAw1:=(x,v)->1/2*v*x*(-2*q^3*v^2*x^3+4*q^2*v^2*x^3+2*q^2*v^2*x^2-
  2*q*v^2*x^3+2*q^2*v*x^2-3*q*v^2*x^2+(4*q^2*v^2*x^2-4*q*v^2*x^2+v^2
  *x^2-4*q*v*x-2*v*x+1)^(1/2)*q*v*x+2*v^2*x^2-3*q*v*x-v^2*x-3*v*x^2-
  (4*q^2*v^2*x^2-4*q*v^2*x^2+v^2*x^2-4*q*v*x-2*v*x+1)^(1/2)*v-(4*q^2
  *v^2*x^2-4*q*v^2*x^2+v^2*x^2-4*q*v*x-2*v*x+1)^(1/2)*x+2*v*x+v-x)/(
  q*v*x-v*x-1)/(q^2*v*x^2-q*v*x^2-q*x+v*x-v-x+1);
```

$$AAAw1 := (x, v) \rightarrow \frac{1}{2} v\, x\, (-2\, q^3\, v^2\, x^3 + 4\, q^2\, v^2\, x^3 + 2\, q^2\, v^2\, x^2 - 2\, q\, v^2\, x^3 + 2\, q^2\, v\, x^2 - 3\, q\, v^2\, x^2 + \sqrt{4\, q^2\, v^2\, x^2 - 4\, q\, v^2\, x^2 + v^2\, x^2 - 4\, q\, v\, x - 2\, v\, x + 1}\; q\, v\, x + 2\, v^2\, x^2 - 3\, q\, v\, x - v^2\, x - 3\, v\, x^2 - \sqrt{4\, q^2\, v^2\, x^2 - 4\, q\, v^2\, x^2 + v^2\, x^2 - 4\, q\, v\, x - 2\, v\, x + 1}\; v - \sqrt{4\, q^2\, v^2\, x^2 - 4\, q\, v^2\, x^2 + v^2\, x^2 - 4\, q\, v\, x - 2\, v\, x + 1}\; x + 2\, v\, x + v - x) \Big/ ((q\, v\, x - v\, x - 1)\, (q^2\, v\, x^2 - q\, v\, x^2 - q\, x + v\, x - v - x + 1))$$

```
>
> #EQ1
> simplify(taylor(-AAN(x,v,w)+q*v^2*w*x^2+v*x*q/(1-v)*AA(x,v*w,1)-v^
  2*x*q/(1-v)*AA(v*x,w,1),x,14));
```

$$O(x^{14})$$

```
> #EQ2
> simplify(taylor(-w*CC(x,v*w)+q*v^2*w^3*x^3+q*v*w^2*x^2*AA(v*w*x,1,
  1)+x*w*CC(x,v*w)+v*w^2*x^3+q*w*x^2/(q*v*w*x+v*w-1)*(v*w*AAP(v*w*x/
  (1-q*v*w*x),1-q*v*w*x,1)-(1-q*v*w*x)*AAP(x,1-q*v*w*x,v*w/(1-q*v*w*
  x))),x,14));
```

$$O(x^{14})$$

```
> #EQ3
> simplify(taylor(-AAP(x,v,w)+w*x*AAN(w*x,v,1)+q*w*x*AAP(w*x,v,1)+v*
  w^2*x^2-q*v^2*w^3*x^3-v*w^2*x^3+w*CC(x,v*w)-q*v*w^2*x^2*AA(v*w*x,1
  ,1)+x*AAP(x,v,w)-q*v*w^2*x^3*AA(v*w*x,1,1)-w*x*CC(x,v*w)+q*v*w^2*x
  ^3*AA(v*w*x,1,1)+q*w*x^2/(q*v*w*x+v-1)*((1-q*v*w*x)*AAP(x,1-q*v*w*
  x,v*w/(1-q*v*w*x))-v*AAP(x,v,w)),x,14));
```

$$O(x^{14})$$

```
> eq1:=-FAAN(x,v,w)+q*v^2*w*x^2+v*x*q/(1-v)*FAA(x,v*w,1)-v^2*x*q/(1-
  v)*FAA(v*x,w,1);
```

$$eq1 := -\mathrm{FAAN}(x, v, w) + q\, v^2\, w\, x^2 + \frac{v\, x\, q\, \mathrm{FAA}(x, v\, w, 1)}{1 - v} - \frac{v^2\, x\, q\, \mathrm{FAA}(v\, x, w, 1)}{1 - v}$$

```
> eq2:=-w*FCC(x,v*w)+q*v^2*w^3*x^3+q*v*w^2*x^2*FAA(v*w*x,1,1)+x*w*FC
  C(x,v*w)+v*w^2*x^3+q*w*x^2/(q*v*w*x+v*w-1)*(v*w*FAAP(v*w*x/(1-q*v*
  w*x),1-q*v*w*x,1)-(1-q*v*w*x)*FAAP(x,1-q*v*w*x,v*w/(1-q*v*w*x)));
```

$$eq2 := -w\, \mathrm{FCC}(x, v\, w) + q\, v^2\, w^3\, x^3 + q\, v\, w^2\, x^2\, \mathrm{FAA}(v\, w\, x, 1, 1) + x\, w\, \mathrm{FCC}(x, v\, w) + v\, w^2\, x^3 + q\, w\, x^2 \Big(v\, w\, \mathrm{FAAP}\left(\frac{v\, w\, x}{-q\, v\, w\, x + 1}, -q\, v\, w\, x + 1, 1\right) - (-q\, v\, w\, x + 1)\, \mathrm{FAAP}\left(x, -q\, v\, w\, x + 1, \frac{v\, w}{-q\, v\, w\, x + 1}\right)\Big) / (q\, v\, w\, x + v\, w - 1)$$

```
> eq3:=-FAAP(x,v,w)+w*x*FAAN(w*x,v,1)+q*w*x*FAAP(w*x,v,1)+v*w^2*x^2-
  q*v^2*w^3*x^3-v*w^2*x^3+w*FCC(x,v*w)-q*v*w^2*x^2*FAA(v*w*x,1,1)+x*
  FAAP(x,v,w)-q*v*w^2*x^3*FAA(v*w*x,1,1)-w*x*FCC(x,v*w)+q*v*w^2*x^3*
  FAA(v*w*x,1,1)+q*w*x^2/(q*v*w*x+v-1)*((1-q*v*w*x)*FAAP(x,1-q*v*w*x
  ,v*w/(1-q*v*w*x))-v*FAAP(x,v,w));
```

$$eq3 := -\mathrm{FAAP}(x, v, w) + w\, x\, \mathrm{FAAN}(w\, x, v, 1) + q\, w\, x\, \mathrm{FAAP}(w\, x, v, 1) + v\, w^2\, x^2 - q\, v^2\, w^3\, x^3 - v\, w^2\, x^3 + w\, \mathrm{FCC}(x, v\, w) - q\, v\, w^2\, x^2\, \mathrm{FAA}(v\, w\, x, 1, 1) + x\, \mathrm{FAAP}(x, v, w) - x\, w\, \mathrm{FCC}(x, v\, w) + \frac{q\, w\, x^2 \left((-q\, v\, w\, x + 1)\, \mathrm{FAAP}\left(x, -q\, v\, w\, x + 1, \frac{v\, w}{-q\, v\, w\, x + 1}\right) - v\, \mathrm{FAAP}(x, v, w)\right)}{q\, v\, w\, x + v - 1}$$

```
> AAAN:=(x,v,w)->1/2*q*v^2*w*x^2*(-2-(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*
  x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)*q^2*v^2*w*x^3-(4*q^2*v^
```

```
2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)*q
*v*w^2*x+2*q*v*x-2*q^2*v*x^2+v*x-v*x^2+x+2*w+2*v^2*w^2*x-w*x-v^3*w
^2*x^3-v^2*w^2*x^3+q*v^2*w^2*x+v^2*w*x^3+q*v*w^2*x-3*q*v*x^2-v*w*x
^2*(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*
x+1)^(1/2)-2*q^2*v^3*w^2*x^3-q^2*v^3*w^3*x^3+v^3*w^2*x^2-2*q^2*v^2
*w^3*x^2-2*q^2*v^2*w*x^2+2*q^2*v*w^2*x^2+2*q*v^2*w^3*x-2*q*v*w^2*x
^2-2*q*v^2*w*x-(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*
v*w*x-2*v*w*x+1)^(1/2)*x+2*q*x+(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+
v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)*v*w^2+(4*q^2*v^2*w^2*x^2-4*
q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)*v*x^2+(4*q^2*
v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)
*w*x+q^2*v^2*w^2*x^2*(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^
2-4*q*v*w*x-2*v*w*x+1)^(1/2)-q*v^2*w^2*x*(4*q^2*v^2*w^2*x^2-4*q*v^
2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)+q*v^2*w*x^3*(4*q^
2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/
2)+4*q*v^2*w*x^2-q^2*v^2*w^2*x^2-2*q^2*v^2*w^2*x^3-2*q^2*v*w*x^2+4
*q*v*w*x^2+q*v^2*w^3*x^2-v^2*w^3*x-v^2*w*x+2*v*w^2*x-2*q*w*x+x^2*v
*w^2+2*v*w+2*q^3*v^3*w^3*x^3+4*q^3*v^3*w^2*x^4-3*q^2*v^3*w^2*x^4-2
*q^2*v^3*w^3*x^2+q*v^3*w^2*x^4+2*q^2*v^3*w^2*x^2+q*v^3*w^3*x^2+2*q
*v^3*w^2*x^3-q^2*v^2*w*x^3-2*q*v^3*w^2*x^2-2*q*v^2*w*x^3-(4*q^2*v^
2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)*v
*x+2*q*x^3*v^2*w^2-2*q^4*v^3*w^2*x^4+4*q^3*v^2*w*x^3-2*q*w^2*x^2*v
^2-2*v*w*x-3*v*w^2-(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-
4*q*v*w*x-2*v*w*x+1)^(1/2)*v^2*w*x^2+(4*q^2*v^2*w^2*x^2-4*q*v^2*w^
2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)*q*v*x^2+(4*q^2*v^2*w^
2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)*v^2*w
*x)/(q^2*v^2*w*x^2-q*v^2*w*x^2-q*v*x+v*w*x-v*x-w+1)/(q*v*w*x-v*w*x
-1)/(q^2*v*w*x^2-q*v*w*x^2+v*w*x-q*x-v*w-x+1);
```

$$
\begin{aligned}
AAAN := (x, v, w) \to \frac{1}{2} q\, v^2\, w\, x^2 \,(&-2 + 2\, q\, v\, x - 2\, q^2\, v\, x^2 - 3\, q\, v\, x^2 + 2\, q\, x + v\, x - v\, x^2 + x + 2\, w \\
&- v^3\, w^2\, x^3 - v^2\, w^2\, x^3 + v^2\, w\, x^3 + v^3\, w^2\, x^2 \\
&+ \sqrt{4\, q^2\, v^2\, w^2\, x^2 - 4\, q\, v^2\, w^2\, x^2 + v^2\, w^2\, x^2 - 4\, q\, v\, w\, x - 2\, v\, w\, x + 1}\; v\, w^2 \\
&+ \sqrt{4\, q^2\, v^2\, w^2\, x^2 - 4\, q\, v^2\, w^2\, x^2 + v^2\, w^2\, x^2 - 4\, q\, v\, w\, x - 2\, v\, w\, x + 1}\; v\, x^2 \\
&+ \sqrt{4\, q^2\, v^2\, w^2\, x^2 - 4\, q\, v^2\, w^2\, x^2 + v^2\, w^2\, x^2 - 4\, q\, v\, w\, x - 2\, v\, w\, x + 1}\; w\, x - v^2\, w^3\, x - v^2\, w\, x + x^2\, v\, w^2 \\
&- \sqrt{4\, q^2\, v^2\, w^2\, x^2 - 4\, q\, v^2\, w^2\, x^2 + v^2\, w^2\, x^2 - 4\, q\, v\, w\, x - 2\, v\, w\, x + 1}\; v\, x - 2\, v\, w\, x + 2\, v^2\, w^2\, x \\
&+ 2\, v\, w^2\, x - 2\, q\, w\, x - w\, x - \sqrt{4\, q^2\, v^2\, w^2\, x^2 - 4\, q\, v^2\, w^2\, x^2 + v^2\, w^2\, x^2 - 4\, q\, v\, w\, x - 2\, v\, w\, x + 1}\; x \\
&+ 2\, v\, w - 3\, v\, w^2 - \sqrt{4\, q^2\, v^2\, w^2\, x^2 - 4\, q\, v^2\, w^2\, x^2 + v^2\, w^2\, x^2 - 4\, q\, v\, w\, x - 2\, v\, w\, x + 1}\; q^2\, v^2\, w\, x^3 \\
&- \sqrt{4\, q^2\, v^2\, w^2\, x^2 - 4\, q\, v^2\, w^2\, x^2 + v^2\, w^2\, x^2 - 4\, q\, v\, w\, x - 2\, v\, w\, x + 1}\; q\, v\, w^2\, x \\
&+ q^2\, v^2\, w^2\, x^2 \sqrt{4\, q^2\, v^2\, w^2\, x^2 - 4\, q\, v^2\, w^2\, x^2 + v^2\, w^2\, x^2 - 4\, q\, v\, w\, x - 2\, v\, w\, x + 1}
\end{aligned}
$$

$$- q v^2 w^2 x \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}$$
$$+ q v^2 w x^3 \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1} + q v^2 w^3 x^2$$
$$+ q v^3 w^2 x^4 + q v^3 w^3 x^2 - q^2 v^2 w x^3$$
$$- \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}\, v^2 w x^2$$
$$+ \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}\, q v x^2$$
$$+ \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}\, v^2 w x - q^2 v^2 w^2 x^2$$
$$- 2 q v^2 w^2 x^2 - 2 q^2 v^3 w^2 x^3 - 2 q^2 v^2 w^3 x^2 - 2 q^2 v^2 w x^2 + 2 q^2 v w^2 x^2 + 2 q v^2 w^3 x - 2 q v w^2 x^2$$
$$- 2 q v^2 w x + 4 q v^2 w x^2 - 2 q^2 v^2 w^2 x^3 - 2 q^2 v w x^2 + 4 q v w x^2 + 2 q^3 v^3 w^3 x^3 + 4 q^3 v^3 w^2 x^4$$
$$- 3 q^2 v^3 w^2 x^4 - 2 q^2 v^3 w^3 x^2 + 2 q^2 v^3 w^2 x^2 + 2 q v^3 w^2 x^3 - 2 q v^3 w^2 x^2 - 2 q v^2 w x^3$$
$$+ 2 q x^3 v^2 w^2 - 2 q^4 v^3 w^2 x^4 + 4 q^3 v^2 w x^3 + q v^2 w^2 x + q v w^2 x$$
$$- v w x^2 \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1} - q^2 v^3 w^3 x^3) \Big/ ($$
$$(q^2 v^2 w x^2 - q v^2 w x^2 - q v x + v w x - v x - w + 1)(q v w x - v w x - 1)$$
$$(q^2 v w x^2 - q v w x^2 + v w x - q x - v w - x + 1))$$

```
> AAAP:=(x,v,w)->1/2*x^2*v*w^2*(-1+v+2*(4*q^2*v^2*w^2*x^2-4*q*v^2*w^
2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)*q*v*w^2*x+10*v^2*w^2*
x+w*x-v^3*w^3*x^3+4*q*v^3*w^2*x-4*q*v^2*w^2*x-2*q*v*w^2*x-2*v*w*x*
(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1
)^(1/2)-2*v^2*w^2*x*(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2
-4*q*v*w*x-2*v*w*x+1)^(1/2)+v*w^2*x^2*(4*q^2*v^2*w^2*x^2-4*q*v^2*w
^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)+6*q^2*v^3*w^4*x^3+2*
q*v^3*w^3*x^3+2*v^3*w^3*x^2+v^3*w^2*x^2-4*v^2*w^3*x^2-q*v^2*w^3*x^
3-3*q^2*v^2*w^3*x^3+6*q^2*v^2*w^3*x^2-2*q*v^2*w*x+3*x*w*q*v+(4*q^2
*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2
)*w*x-2*q^2*v^2*w^3*x^2*(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2
*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)+2*q*v^2*w^3*x^2*(4*q^2*v^2*w^2*x^2
-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)+3*v^2*w^3*
x^3-6*v^2*w-2*q^2*v^2*w^2*x^2+2*q^3*v^3*w^4*x^4-3*q^2*v^3*w^4*x^4+
q*v^3*w^4*x^4-2*v^3*w^2*x+6*v^2*w*x-4*v*w^2*x+2*(4*q^2*v^2*w^2*x^2
-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)*v^2*w+(4*q
^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1
/2)*v-9*v^2*w^2*x^2+4*x^2*v*w^2+4*v*w-4*q^3*v^3*w^4*x^3-2*q*v^3*w^
4*x^3-4*q*v^3*w^3*x^2-2*q*v^3*w^2*x^2+(4*q^2*v^2*w^2*x^2-4*q*v^2*w
^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)*v^2*w^2*x^2+7*q*w^2*
x^2*v^2-(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2
*v*w*x+1)^(1/2)+(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q
*v*w*x-2*v*w*x+1)^(1/2)*q^2*v^2*w^3*x^3-(4*q^2*v^2*w^2*x^2-4*q*v^2
*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)*q*v^2*w^3*x^3-2*(4
*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^
```

```
(1/2)*q*v*w^2*x^2+(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^2*x^2-4
*q*v*w*x-2*v*w*x+1)^(1/2)*q*v*w*x-5*v*w*x-(4*q^2*v^2*w^2*x^2-4*q*v
^2*w^2*x^2+v^2*w^2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2)*v^2*w*x)/(q*v*w*
x-v*w*x-1)/(q*v*w*x^2-2*q*v*w*x-v*w*x^2+3*v*w*x-2*v*w-x+1)/(q^2*v*
w^2*x^2-q*v*w^2*x^2-q*w*x+v*w*x-w*x-v+1);
```

$$
\begin{aligned}
AAAP := (x, v, w) \to \frac{1}{2} x^2 v w^2 (&-1 + v \\
&- \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1} - 9 v^2 w^2 x^2 + v^3 w^2 x^2 \\
&+ \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}\ w x + 6 v^2 w x + 4 x^2 v w^2 \\
&- 5 v w x + 10 v^2 w^2 x - 4 v w^2 x - v^3 w^3 x^3 + 2 v^3 w^3 x^2 - 4 v^2 w^3 x^2 + 3 v^2 w^3 x^3 - 2 v^3 w^2 x \\
&+ 2 \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}\ v^2 w + w x + 4 v w \\
&+ \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}\ v - 6 v^2 w \\
&+ v w^2 x^2 \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1} - q v^2 w^3 x^3 \\
&+ q v^3 w^4 x^4 + \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}\ v^2 w^2 x^2 \\
&+ 4 q v^3 w^2 x - 2 v w x \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1} \\
&- 2 v^2 w^2 x \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1} + 6 q^2 v^3 w^4 x^3 \\
&+ 2 q v^3 w^3 x^3 - 3 q^2 v^2 w^3 x^3 + 2 q^3 v^3 w^4 x^4 - 3 q^2 v^3 w^4 x^4 - 4 q^3 v^3 w^4 x^3 - 2 q v^3 w^4 x^3 \\
&+ \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}\ q^2 v^2 w^3 x^3 \\
&- \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}\ q v^2 w^3 x^3 \\
&+ \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}\ q v w x \\
&- 2 q^2 v^2 w^3 x^2 \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1} \\
&+ 2 q v^2 w^3 x^2 \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1} \\
&- 2 \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}\ q v w^2 x^2 \\
&+ 2 \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}\ q v w^2 x - 4 q v^3 w^3 x^2 \\
&- \sqrt{4 q^2 v^2 w^2 x^2 - 4 q v^2 w^2 x^2 + v^2 w^2 x^2 - 4 q v w x - 2 v w x + 1}\ v^2 w x - 2 q^2 v^2 w^2 x^2 \\
&+ 7 q v^2 w^2 x^2 + 3 q v w x + 6 q^2 v^2 w^3 x^2 - 2 q v^2 w x - 2 q v^3 w^2 x^2 - 4 q v^2 w^2 x - 2 q v w^2 x) \Big/ (\\
&(q v w x - v w x - 1)(q v w x^2 - 2 q v w x - v w x^2 + 3 v w x - 2 v w - x + 1) \\
&(q^2 v w^2 x^2 - q v w^2 x^2 - q w x + v w x - w x - v + 1))
\end{aligned}
$$

```
> solve(subs(w=1,eq2)=0,FCC(x,v));
FINCC:=(x,v)->-x^2*(q^2*v^3*x^2+AAA(v*x,1,1)*q^2*v^2*x+AAAP(x,-q*v
*x+1,v/(-q*v*x+1))*q^2*v*x+q*v^3*x+q*v^2*x^2+AAA(v*x,1,1)*q*v^2-q*
v^2*x-q*v*AAA(v*x,1,1)+AAAP(v*x/(-q*v*x+1),-q*v*x+1,1)*q*v+v^2*x-A
AAP(x,-q*v*x+1,v/(-q*v*x+1))*q-v*x)/(q*v*x+v-1)/(-1+x);
```

$$-x^2\left(q^2 v^3 x^2+\mathrm{FAA}(v\,x,1,1)\,q^2 v^2 x+\mathrm{FAAP}\left(x,-q\,v\,x+1,\frac{v}{-q\,v\,x+1}\right)q^2 v\,x+q\,v^3 x+q\,v^2 x^2\right.$$
$$+\mathrm{FAA}(v\,x,1,1)\,q\,v^2-q\,v^2 x-q\,v\,\mathrm{FAA}(v\,x,1,1)+\mathrm{FAAP}\left(\frac{v\,x}{-q\,v\,x+1},-q\,v\,x+1,1\right)q\,v+v^2 x$$
$$\left.-\mathrm{FAAP}\left(x,-q\,v\,x+1,\frac{v}{-q\,v\,x+1}\right)q-v\,x\right)/\left((q\,v\,x+v-1)\,(-1+x)\right)$$

$$FINCC:=(x,v)\to -x^2\left(q^2 v^3 x^2+\mathrm{AAA}(v\,x,1,1)\,q^2 v^2 x\right.$$
$$+\mathrm{AAAP}\left(x,-q\,v\,x+1,\frac{v}{-q\,v\,x+1}\right)q^2 v\,x+q\,v^3 x+q\,v^2 x^2+\mathrm{AAA}(v\,x,1,1)\,q\,v^2-q\,v^2 x$$
$$-q\,v\,\mathrm{AAA}(v\,x,1,1)+\mathrm{AAAP}\left(\frac{v\,x}{-q\,v\,x+1},-q\,v\,x+1,1\right)q\,v+v^2 x$$
$$\left.-\mathrm{AAAP}\left(x,-q\,v\,x+1,\frac{v}{-q\,v\,x+1}\right)q-v\,x\right)/\left((q\,v\,x+v-1)\,(x-1)\right)$$

```
> AAA:=(x,v,w)->AAAN(x,v,w)+AAAP(x,v,w);
```

$$AAA:=(x,v,w)\to \mathrm{AAAN}(x,v,w)+\mathrm{AAAP}(x,v,w)$$

```
> ###checking equations
> eq1;
simplify(-AAAN(x,v,w)+q*v^2*w*x^2+v*x*q/(1-v)*AAA(x,v*w,1)-v^2*x*q
/(1-v)*AAA(v*x,w,1));
```

$$-\mathrm{FAAN}(x,v,w)+q\,v^2 w\,x^2+\frac{v\,x\,q\,\mathrm{FAA}(x,v\,w,1)}{1-v}-\frac{v^2 x\,q\,\mathrm{FAA}(v\,x,w,1)}{1-v}$$

$$0$$

```
> eq2;
simplify(-w*FINCC(x,v*w)+q*v^2*w^3*x^3+q*v*w^2*x^2*AAA(v*w*x,1,1)+
x*w*FINCC(x,v*w)+v*w^2*x^3+q*w*x^2/(q*v*w*x+v*w-1)*(v*w*AAAP(v*w*x
/(-q*v*w*x+1),-q*v*w*x+1,1)-(-q*v*w*x+1)*AAAP(x,-q*v*w*x+1,v*w/(-q
*v*w*x+1))));
```

$$-w\,\mathrm{FCC}(x,v\,w)+q\,v^2 w^3 x^3+q\,v\,w^2 x^2\,\mathrm{FAA}(v\,w\,x,1,1)+x\,w\,\mathrm{FCC}(x,v\,w)+v\,w^2 x^3+q\,w\,x^2\left(\right.$$
$$\left.v\,w\,\mathrm{FAAP}\left(\frac{v\,w\,x}{-q\,v\,w\,x+1},-q\,v\,w\,x+1,1\right)-(-q\,v\,w\,x+1)\,\mathrm{FAAP}\left(x,-q\,v\,w\,x+1,\frac{v\,w}{-q\,v\,w\,x+1}\right)\right)$$
$$/\,(q\,v\,w\,x+v\,w-1)$$

$$0$$

```
> eq3;
simplify(-AAAP(x,v,w)+w*x*AAAN(w*x,v,1)+q*w*x*AAAP(w*x,v,1)+v*w^2*
x^2-q*v^2*w^3*x^3-v*w^2*x^3+w*FINCC(x,v*w)-q*v*w^2*x^2*AAA(v*w*x,1
,1)+x*AAAP(x,v,w)-x*w*FINCC(x,v*w)+q*w*x^2/(q*v*w*x+v-1)*((-q*v*w*
```

```
x+1)*AAAP(x,-q*v*w*x+1,v*w/(-q*v*w*x+1))-v*AAAP(x,v,w)));
```

$$-\mathrm{FAAP}(x, v, w) + w\,x\,\mathrm{FAAN}(w\,x, v, 1) + q\,w\,x\,\mathrm{FAAP}(w\,x, v, 1) + v\,w^2\,x^2 - q\,v^2\,w^3\,x^3 - v\,w^2\,x^3 + w\,\mathrm{FCC}(x, v\,w) - q\,v\,w^2\,x^2\,\mathrm{FAA}(v\,w\,x, 1, 1) + x\,\mathrm{FAAP}(x, v, w) - x\,w\,\mathrm{FCC}(x, v\,w) + \frac{q\,w\,x^2\left((-q\,v\,w\,x+1)\,\mathrm{FAAP}\left(x, -q\,v\,w\,x+1, \frac{v\,w}{-q\,v\,w\,x+1}\right) - v\,\mathrm{FAAP}(x, v, w)\right)}{q\,v\,w\,x+v-1}$$

$$0$$

```
> ##presentation of the functions A^+=AAAP
> factor(coeff(AAAP(x,v,w),(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^
  2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2),1));
  factor(taylor(q^2*v^2*w^3*x^3-2*q^2*v^2*w^3*x^2-q*v^2*w^3*x^3+2*q*
  v^2*w^3*x^2-2*q*v*w^2*x^2+v^2*w^2*x^2+2*q*v*w^2*x-2*v^2*w^2*x+v*w^
  2*x^2+q*v*w*x-v^2*w*x+2*v^2*w-2*v*w*x+w*x+v-1,x,10));
```

$$x^2\,v\,w^2\,(q^2\,v^2\,w^3\,x^3 - 2\,q^2\,v^2\,w^3\,x^2 - q\,v^2\,w^3\,x^3 + 2\,q\,v^2\,w^3\,x^2 - 2\,q\,v\,w^2\,x^2 + v^2\,w^2\,x^2 + 2\,q\,v\,w^2\,x - 2\,v^2\,w^2\,x + v\,w^2\,x^2 + q\,v\,w\,x - v^2\,w\,x + 2\,v^2\,w - 2\,v\,w\,x + w\,x + v - 1) \Big/ (2\,(q\,v\,w\,x - v\,w\,x - 1)\,(q\,v\,w\,x^2 - 2\,q\,v\,w\,x - v\,w\,x^2 + 3\,v\,w\,x - 2\,v\,w - x + 1)\,(q^2\,v\,w^2\,x^2 - q\,v\,w^2\,x^2 - q\,w\,x + v\,w\,x - w\,x - v + 1))$$

$$(2\,v^2\,w + v - 1) + w\,(2\,q\,v\,w - 2\,v^2\,w + q\,v - v^2 - 2\,v + 1)\,x - v\,w^2\,(2\,q^2\,v\,w - 2\,q\,v\,w + 2\,q - v - 1)\,x^2 + q\,v^2\,w^3\,(q-1)\,x^3$$

```
> factor(coeff(AAAP(x,v,w),(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^
  2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2),0));
  factor(taylor(2*q^3*v^3*w^4*x^4-4*q^3*v^3*w^4*x^3-3*q^2*v^3*w^4*x^
  4+6*q^2*v^3*w^4*x^3+q*v^3*w^4*x^4-2*q*v^3*w^4*x^3-3*q^2*v^2*w^3*x^
  3+2*q*v^3*w^3*x^3+6*q^2*v^2*w^3*x^2-4*q*v^3*w^3*x^2-q*v^2*w^3*x^3-
  v^3*w^3*x^3-2*q^2*v^2*w^2*x^2-2*q*v^3*w^2*x^2+2*v^3*w^3*x^2+3*v^2*
  w^3*x^3+4*q*v^3*w^2*x+7*q*v^2*w^2*x^2+v^3*w^2*x^2-4*v^2*w^3*x^2-4*
  q*v^2*w^2*x-2*v^3*w^2*x-9*v^2*w^2*x^2-2*q*v^2*w*x-2*q*v*w^2*x+10*v
  ^2*w^2*x+4*v*w^2*x^2+3*q*v*w*x+6*v^2*w*x-4*v*w^2*x-6*v^2*w-5*v*w*x
  +4*v*w+w*x+v-1,x,10));
```

$$x^2\,v\,w^2\,(2\,q^3\,v^3\,w^4\,x^4 - 4\,q^3\,v^3\,w^4\,x^3 - 3\,q^2\,v^3\,w^4\,x^4 + 6\,q^2\,v^3\,w^4\,x^3 + q\,v^3\,w^4\,x^4 - 2\,q\,v^3\,w^4\,x^3 - 3\,q^2\,v^2\,w^3\,x^3 + 2\,q\,v^3\,w^3\,x^3 + 6\,q^2\,v^2\,w^3\,x^2 - 4\,q\,v^3\,w^3\,x^2 - q\,v^2\,w^3\,x^3 - v^3\,w^3\,x^3 - 2\,q^2\,v^2\,w^2\,x^2 - 2\,q\,v^3\,w^2\,x^2 + 2\,v^3\,w^3\,x^2 + 3\,v^2\,w^3\,x^3 + 4\,q\,v^3\,w^2\,x + 7\,q\,v^2\,w^2\,x^2 + v^3\,w^2\,x^2 - 4\,v^2\,w^3\,x^2 - 4\,q\,v^2\,w^2\,x - 2\,v^3\,w^2\,x - 9\,v^2\,w^2\,x^2 - 2\,q\,v^2\,w\,x - 2\,q\,v\,w^2\,x + 10\,v^2\,w^2\,x + 4\,v\,w^2\,x^2 + 3\,q\,v\,w\,x + 6\,v^2\,w\,x - 4\,v\,w^2\,x - 6\,v^2\,w - 5\,v\,w\,x + 4\,v\,w + w\,x + v - 1) \Big/ (2\,(q\,v\,w\,x - v\,w\,x - 1)\,(q\,v\,w\,x^2 - 2\,q\,v\,w\,x - v\,w\,x^2 + 3\,v\,w\,x - 2\,v\,w - x + 1)\,(q^2\,v\,w^2\,x^2 - q\,v\,w^2\,x^2 - q\,w\,x + v\,w\,x - w\,x - v + 1))$$

$$(-6\,v^2\,w + 4\,v\,w + v - 1) +$$

$$w\,(4\,q\,v^3\,w-4\,q\,v^2\,w-2\,v^3\,w-2\,q\,v^2-2\,q\,v\,w+10\,v^2\,w+3\,q\,v+6\,v^2-4\,v\,w-5\,v+1)\,x+$$
$$v\,w^2\,(6\,q^2\,v\,w-4\,q\,v^2\,w-2\,q^2\,v-2\,q\,v^2+2\,v^2\,w+7\,q\,v+v^2-4\,v\,w-9\,v+4)\,x^2-$$
$$v^2\,w^3\,(4\,q^3\,v\,w-6\,q^2\,v\,w+2\,q\,v\,w+3\,q^2-2\,q\,v+q+v-3)\,x^3+q\,v^3\,w^4\,(2\,q-1)\,(q-1)\,x^4$$

```
> ##presentation of the functions A^+=AAAN
> factor(coeff(AAAN(x,v,w),(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^
  2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2),1));
  factor(taylor(q^2*v^2*w^2*x^2-q^2*v^2*w*x^3+q*v^2*w*x^3-q*v^2*w^2*
  x-q*v*w^2*x-v^2*w*x^2+q*v*x^2+v^2*w*x-v*w*x^2+v*w^2+v*x^2-v*x+w*x-
  x,x,10));
```

$$q\,v^2\,w\,x^2\,(q^2\,v^2\,w^2\,x^2-q^2\,v^2\,w\,x^3+q\,v^2\,w\,x^3-q\,v^2\,w^2\,x-q\,v\,w^2\,x-v^2\,w\,x^2+q\,v\,x^2+v^2\,w\,x$$
$$-v\,w\,x^2+v\,w^2+v\,x^2-v\,x+w\,x-x)\Big/(2\,(q^2\,v^2\,w\,x^2-q\,v^2\,w\,x^2-q\,v\,x+v\,w\,x-v\,x-w+1)$$
$$(q\,v\,w\,x-v\,w\,x-1)\,(q^2\,v\,w\,x^2-q\,v\,w\,x^2+v\,w\,x-q\,x-v\,w-x+1))$$
$$v\,w^2+(-q\,v^2\,w^2-q\,v\,w^2+v^2\,w-v+w-1)\,x+v\,(q^2\,v\,w^2-v\,w+q-w+1)\,x^2-q\,v^2\,w\,(q-1)$$
$$x^3$$

```
> factor(coeff(AAAN(x,v,w),(4*q^2*v^2*w^2*x^2-4*q*v^2*w^2*x^2+v^2*w^
  2*x^2-4*q*v*w*x-2*v*w*x+1)^(1/2),0));
  factor(taylor(-(2*q^4*v^3*w^2*x^4-2*q^3*v^3*w^3*x^3-4*q^3*v^3*w^2*
  x^4+q^2*v^3*w^3*x^3+3*q^2*v^3*w^2*x^4+2*q^2*v^3*w^3*x^2+2*q^2*v^3*
  w^2*x^3-q*v^3*w^2*x^4-4*q^3*v^2*w*x^3-2*q^2*v^3*w^2*x^2+2*q^2*v^2*
  w^3*x^2+2*q^2*v^2*w^2*x^3-q*v^3*w^3*x^2-2*q*v^3*w^2*x^3+q^2*v^2*w^
  2*x^2+q^2*v^2*w*x^3+2*q*v^3*w^2*x^2-q*v^2*w^3*x^2-2*q*v^2*w^2*x^3+
  v^3*w^2*x^3+2*q^2*v^2*w*x^2-2*q^2*v*w^2*x^2-2*q*v^2*w^3*x+2*q*v^2*
  w^2*x^2+2*q*v^2*w*x^3-v^3*w^2*x^2+v^2*w^2*x^3+2*q^2*v*w*x^2-q*v^2*
  w^2*x-4*q*v^2*w*x^2+2*q*v*w^2*x^2+v^2*w^3*x-v^2*w*x^3+2*q^2*v*x^2+
  2*q*v^2*w*x-q*v*w^2*x-4*q*v*w*x^2-2*v^2*w^2*x-v*w^2*x^2+3*q*v*x^2+
  v^2*w*x-2*v*w^2*x-2*q*v*x+2*q*w*x+3*v*w^2+2*v*w*x+v*x^2-2*q*x-2*v*
  w-v*x+w*x-2*w-x+2),x,10));
```

$$-q\,v^2\,w\,x^2\,(2\,q^4\,v^3\,w^2\,x^4-2\,q^3\,v^3\,w^3\,x^3-4\,q^3\,v^3\,w^2\,x^4+q^2\,v^3\,w^3\,x^3+3\,q^2\,v^3\,w^2\,x^4+2\,q^2\,v^3\,w^3\,x^2$$
$$+2\,q^2\,v^3\,w^2\,x^3-q\,v^3\,w^2\,x^4-4\,q^3\,v^2\,w\,x^3-2\,q^2\,v^3\,w^2\,x^2+2\,q^2\,v^2\,w^3\,x^2+2\,q^2\,v^2\,w^2\,x^3-q\,v^3\,w^3\,x^2$$
$$-2\,q\,v^3\,w^2\,x^3+q^2\,v^2\,w^2\,x^2+q^2\,v^2\,w\,x^3+2\,q\,v^3\,w^2\,x^2-q\,v^2\,w^3\,x^2-2\,q\,v^2\,w^2\,x^3+v^3\,w^2\,x^3$$
$$+2\,q^2\,v^2\,w\,x^2-2\,q^2\,v\,w^2\,x^2-2\,q\,v^2\,w^3\,x+2\,q\,v^2\,w^2\,x^2+2\,q\,v^2\,w\,x^3-v^3\,w^2\,x^2+v^2\,w^2\,x^3$$
$$+2\,q^2\,v\,w\,x^2-q\,v^2\,w^2\,x-4\,q\,v^2\,w\,x^2+2\,q\,v\,w^2\,x^2+v^2\,w^3\,x-v^2\,w\,x^3+2\,q^2\,v\,x^2+2\,q\,v^2\,w\,x$$
$$-q\,v\,w^2\,x-4\,q\,v\,w\,x^2-2\,v^2\,w^2\,x-v\,w^2\,x^2+3\,q\,v\,x^2+v^2\,w\,x-2\,v\,w^2\,x-2\,q\,v\,x+2\,q\,w\,x$$
$$+3\,v\,w^2+2\,v\,w\,x+v\,x^2-2\,q\,x-2\,v\,w-v\,x+w\,x-2\,w-x+2)\Big/(2$$
$$(q^2\,v^2\,w\,x^2-q\,v^2\,w\,x^2-q\,v\,x+v\,w\,x-v\,x-w+1)\,(q\,v\,w\,x-v\,w\,x-1)$$
$$(q^2\,v\,w\,x^2-q\,v\,w\,x^2+v\,w\,x-q\,x-v\,w-x+1))$$
$$(-3\,v\,w^2+2\,v\,w+2\,w-2)+(2\,q\,v^2\,w^3+q\,v^2\,w^2-v^2\,w^3-2\,q\,v^2\,w+q\,v\,w^2+2\,v^2\,w^2-v^2\,w$$

$$+ 2\, v\, w^2 + 2\, q\, v - 2\, q\, w - 2\, v\, w + 2\, q + v - w + 1)\, x - v\, (2\, q^2\, v^2\, w^3 - 2\, q^2\, v^2\, w^2 + 2\, q^2\, v\, w^3$$
$$- q\, v^2\, w^3 + q^2\, v\, w^2 + 2\, q\, v^2\, w^2 - q\, v\, w^3 + 2\, q^2\, v\, w - 2\, q^2\, w^2 + 2\, q\, v\, w^2 - v^2\, w^2 + 2\, q^2\, w - 4\, q\, v\, w$$
$$+ 2\, q\, w^2 + 2\, q^2 - 4\, q\, w - w^2 + 3\, q + 1)\, x^2 +$$
$$v^2\, w\, (2\, q^3\, v\, w^2 - q^2\, v\, w^2 - 2\, q^2\, v\, w + 4\, q^3 - 2\, q^2\, w + 2\, q\, v\, w - q^2 + 2\, q\, w - v\, w - 2\, q - w + 1)\, x^3$$
$$- q\, v^3\, w^2\, (q - 1)\, (2\, q^2 - 2\, q + 1)\, x^4$$

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