```
xor_vs_neg_n_dec  THM

⊢  P XOR Q ⟺ (Q ⟺ ¬P) & Dec(P)  by UnivCD
|
1. P : Prop
2. Q : Prop
⊢  P XOR Q ⟺ (Q ⟺ ¬P) & Dec(P)  by Analyze THEN Analyze
|
|\
| 3. P XOR Q
| ⊢  (Q ⟺ ¬P) & Dec(P)
| | by Analyze3
| |    THEN
| |    UnfoldTop Def  P & Q == P×Q    {and} 0
| |    THEN
| |    FoldTop Def  A & B == A×B    {cand} 0
| |    THEN
| |    Analyze
| |
| |\
| | 3. P ∨ Q
| | 4. ¬(P & Q)
| | ⊢  Q ⟺ ¬P  by Auto
| | |
| | |\
| | | 5. Q
| | | ⊢  ¬P  by SimilarTo: Hyp:4
| | |
| | .\
| | . 5. ¬P
| | . ⊢  Q  by Analyze3
| |
| .\
| . 3. P ∨ Q
| . 4. ¬(P & Q)
| . 5. Q ⟺ ¬P
| . ⊢  Dec(P)  by Rewrite-3 by Q ⟺ ¬P
| . |
| . 6. P ∨ ¬P
| . ⊢  Dec(P)  by Def
|
.\
. 3. (Q ⟺ ¬P) & Dec(P)
. ⊢  P XOR Q
. | by Guarding (<prop> ⟺ <prop>) Def THEN Rewrite by Q ⟺ ¬P
. |
. |\
. | 3. Q ⇒ ¬P
. | 4. Q ⇐ (¬P)
. | 5. Dec(P)
. | ⊢  P ∨ ¬P  by (-1) Def
. |
. .\
. . 3. Q ⇒ ¬P
. . 4. Q ⇐ (¬P)
```

```
. . 5. Dec(P)
. . ⊢  ¬(P & ¬P)  by Analyze
END
```