Verification : Homework 3

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1.)

If $s \in \llbracket EGr \rrbracket$, then in particular $r \in \updownarrow(s)$.
Thus $\llbracket EGr \rrbracket \subseteq \{6, 8\}$
As $M, 6^\omega \models Gr$ and $M, 8^\omega \models Gr$, $\llbracket EGr \rrbracket = \{6, 8\}$

2.)

$s \in \llbracket AXq \rrbracket$ if and only if $\forall s'$ successors of $s, q \in \updownarrow(s')$.
Thus $\llbracket AXq \rrbracket = \{2, 4, 8\}$

3.)

$s \in \llbracket \phi \rrbracket$, iff $s \in \llbracket EGr \rrbracket$ or ($q \notin \updownarrow(s)$ and s has a successor s' such that $q \in l(s')$)
Thus, $\llbracket \phi \rrbracket = \llbracket EGr \rrbracket \cup \{2\} = \{2, 6, 8\}$

4.)

Let us notice that a path satisfies $GF(q \wedge \neg r)$ if and only if it intersects infinitely many times with $\llbracket q \wedge \neg r \rrbracket = \{3, 4\}$.
Such a path always exists only from states 1,2,3,4,5 and 8.
In the same fashion, a path satisfies $GF\phi$ if and only if it intersects infinitely many times with $\llbracket \phi \rrbracket = \{2, 6, 8\}$.
This is always the case for a path starting from 6 or 7.
Thus $\llbracket E\psi \rrbracket = \{1, 2, 3, 4, 5, 8\}$