# Birth and Death Chains

*The process below is not a birth and death chain, but a problem similar to this one can be found in the Birth and Death Chain handout.*

The weather in a certain city can be in one of 3 states: sunny (1), cloudy (2), or rainy (3). Suppose the weather evolves over time according to a continuous time Markov chain with the following transition rate matrix. Rates are all per day (24 hours). (Diagonals left blank on purpose.)

$$\mathbf{Q} = \begin{bmatrix} & 0.25 & 0 \\ 0.8 & & 0.4 \\ 2.0 & 1.5 & \end{bmatrix}$$

Given that it is currently cloudy, compute the expected number of days elapsed from now until it is sunny.