**Exercise 1.** ***Inference for the binary symmetric channel***

Let $x_0$ be a binary random variable taking on states 0 and 1 with probability 1/2. A binary symmetric channel (BSC) flips an input bit with probability $f$, and leaves it unflipped with probability $1 - f$. Let $x_1$ be the result of passing $x_0$ through the BSC. Hence we have that $p(x_1 = 0|x_0 = 0) = p(x_1 = 1|x_0 = 1) = 1 - f$. Now suppose that $x_1$ is passed through another BSC (also with flip probability $f$) to yield $x_2$. The graphical model is thus $x_0 \rightarrow x_1 \rightarrow x_2$.

(a) You observe that $x_2 = 1$. Compute $p(x_0 = 1|x_2 = 1)$.

 