Exercise 3

$$
\begin{aligned}
\mathrm{MI}(T_k, C_1) &= \log_2\left(\frac{P[T_k, C_1]}{P[T_k]P[C_1]}\right) \\
&= \log_2\left(\frac{\frac{10}{100}}{\frac{20}{100}\cdot\frac{45}{100}}\right) \\
&= \log_2\left(\frac{10\cdot 100}{45\cdot 20}\right) \\
&\approx 0.152
\end{aligned}
$$

$$
\begin{aligned}
\mathrm{MI}(T_k, C_2) &= \log_2\left(\frac{P[T_k, C_2]}{P[T_k]P[C_2]}\right) \\
&= \log_2\left(\frac{\frac{50}{165}}{\frac{55}{165}\cdot\frac{70}{165}}\right) \\
&= \log_2\left(\frac{165\cdot 50}{55\cdot 70}\right) \\
&\approx 1.1
\end{aligned}
$$

$$
\begin{aligned}
\mathrm{MI}(T_k, C_3) &= \log_2\left(\frac{P[T_k, C_3]}{P[T_k]P[C_3]}\right) \\
&= \log_2\left(\frac{\frac{100}{1100}}{\frac{300}{1100}\cdot\frac{400}{1100}}\right) \\
&= \log_2\left(\frac{1100\cdot 100}{300\cdot 400}\right) \\
&\approx -0.126
\end{aligned}
$$

We can derive a category-independent term score by applying the sum function

$$
f_{sum}(T_k) = \sum_{i=1}^{|C|} \mathrm{MI}(T_k, C_i)
$$

which will lead to the following result:

$$
f_{sum}(T_k) = 0.152 + 1.1 - 0.126 = 1.126.
$$