Max-SAT Approximation

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Problem 1

$$4 \cdot \frac{7}{8} = \frac{7}{2} = 3.5 \tag{1}$$

Problem 2

There is a truth assignment that satisfies all the clauses.

Problem 3

By setting $x_1 = $ T, the clauses involving x_1 reduce to

$$
\begin{aligned}
x_1 \vee x_2 \vee \overline{x}_4 &= \text{T}, \\
x_1 \vee \overline{x}_2 \vee x_3 &= \text{T}.
\end{aligned}
$$

The other 2 clauses remain unchanged. Then the expected number of clauses we can satisfy is given by

$$1 + \frac{7}{8} + 1 + \frac{7}{8} = 3 + \frac{3}{4} = 3.75. \tag{2}$$

Problem 4

By setting $x_1 = $ F, the clauses involving x_1 reduce to

$$
\begin{aligned}
x_1 \vee x_2 \vee \overline{x}_4 &= x_2 \vee \overline{x}_4, \\
x_1 \vee \overline{x}_2 \vee x_3 &= \overline{x}_2 \vee x_3.
\end{aligned}
$$

The other 2 clauses remain unchanged. Then the expected number of clauses we can satisfy is given by

$$\frac{3}{4} + \frac{7}{8} + \frac{3}{4} + \frac{7}{8} = \frac{13}{4} = 3.25. \tag{3}$$

Problem 5

True