# 1. 5.1, p.239

Suppose that is decidable by Turing machine . Construct a decider for is a CFG and as follows:

“On input :

1. Construct a CFG where
2. Run on input
3. If accepts, accept and if rejects, reject.”

Therefore is a decider for if exists. But it was proven that is undecidable so cannot exist and we have a contradiction. Thus, is undecidable.

# 2. 5.3, p.239

# 3. 5.4, p.239

# 5.