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import re

def main(rules, goal):
    rules = rules.split(' ')
    steps = resolve(rules, goal)
    print('\nStep\t|Clause\t|Derivation\t')
    print('-' * 30)
    i = 1
    for step in steps:
        print(f' {i}.\t| {step}\t| {steps[step]}\t')
        i += 1

def negate(term):
    return f'~{term}' if term[0] != '~' else term[1]

def reverse(clause):
    if len(clause) > 2:
        t = split_terms(clause)
        return f'{t[1]}v{t[0]}'
    return ''

def split_terms(rule):
    exp = '(~*[ABCD])'
    terms = re.findall(exp, rule)
    return terms

split_terms('~AvC')

def contradiction(goal, clause):
    contradictions = [ f'{goal}v{negate(goal)}', f'{negate(goal)}v{goal}' ]
    return clause in contradictions or reverse(clause) in contradictions

def resolve(rules, goal):
    temp = rules.copy()
    temp += [negate(goal)]
    steps = dict()
    for rule in temp:
        steps[rule] = 'Given.'
    steps[negate(goal)] = 'Negated conclusion.'
    i = 0
    while i < len(temp):
        n = len(temp)
        j = (i + 1) % n
        clauses = []
        while j != i:
            terms1 = split_terms(temp[i])
            terms2 = split_terms(temp[j])
            for c in terms1:

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        if negate(c) in terms2:
            t1 = [t for t in terms1 if t != c]
            t2 = [t for t in terms2 if t != negate(c)]
            gen = t1 + t2
            if len(gen) == 2:
                if gen[0] != negate(gen[1]):
                    clauses += [f'{gen[0]}v{gen[1]}']
                else:
                    if contradiction(goal, f'{gen[0]}v{gen[1]}'):
                        temp.append(f'{gen[0]}v{gen[1]}')
                        steps[''] = f"Resolved {temp[i]} and {temp[j]}
to {temp[-1]}, which is in turn null. \
\nA contradiction is found when {negate(goal)}
is assumed as true. Hence, {goal} is true."
                        return steps
                    elif len(gen) == 1:
                        clauses += [f'{gen[0]}']
                    else:
                        if contradiction(goal, f'{terms1[0]}v{terms2[0]}'):
                            temp.append(f'{terms1[0]}v{terms2[0]}')
                            steps[''] = f"Resolved {temp[i]} and {temp[j]} to
{temp[-1]}, which is in turn null. \
\nA contradiction is found when {negate(goal)} is
assumed as true. Hence, {goal} is true."
                            return steps
            for clause in clauses:
                if clause not in temp and clause != reverse(clause) and reverse(clause) not in temp:
                    temp.append(clause)
                    steps[clause] = f'Resolved from {temp[i]} and {temp[j]}.'
            j = (j + 1) % n
            i += 1
        return steps

rules = 'A=>B C=>D'
goal='A v C => B v D'
main(rules, 'A v C => B v D')

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