1a.

X	Y	Z	¬X	¬Y	¬X ∨ Z ∨ ¬Y	X ∧ Y	X ∧ Y → Z
T	T	T	F	F	T	T	T
T	T	F	F	F	F	T	F
T	F	T	F	T	T	F	T
T	F	F	F	T	T	F	T
F	T	T	T	F	T	F	T
F	T	F	T	F	T	F	T
F	F	T	T	T	T	F	T
F	F	F	T	T	T	F	T

1b.

A	B	C	D	A ∧ B	C ∧ D	A ∧ B → C ∧ D	A ∧ B → C
T	T	T	T	T	T	T	T
T	T	T	F	T	F	F	T
T	T	F	T	T	F	F	F
T	T	F	F	T	F	F	F

Every row that A ∧ B → C ∧ D is true, A ∧ B → C is true.

1c.

1. Given: A∧B→C∧D
2. If A∧B then C∧D because Modus Poneus
3. Then C because of step 2
4. Thus A∧B→C

1d.

1. Given: A∧B→C∧D
2. Is equal to ¬(A∧B)∨(C∧D)
3. Distribution: ¬A∨¬B∨C∧D
4. Can derive clause: ¬A∨C, ¬B∨C
5. Meaning: A∧B→C

2a.
Observations:
$O1Y \rightarrow (C1Y \vee C1B)$
$O1W \rightarrow (C1W \vee C1B)$
$O2Y \rightarrow (C2Y \vee C2B)$
$O2W \rightarrow (C2W \vee C2B)$
$O3Y \rightarrow (C3Y \vee C3B)$
$O3W \rightarrow (C3W \vee C3B)$
Labels:
$L1W \rightarrow C1Y \vee C1B$
$L1Y \rightarrow C1W \vee C1B$
$L1B \rightarrow C1W \vee C1Y$
$L2W \rightarrow C2Y \vee C2B$
$L2Y \rightarrow C2W \vee C2B$
$L2B \rightarrow C2W \vee C2Y$
$L3W \rightarrow C3Y \vee C3B$
$L3Y \rightarrow C3W \vee C3B$
$L3B \rightarrow C3W \vee C3Y$
Contains:
$C1Y \rightarrow (\neg C2Y \wedge \neg C3Y)$
$C1W \rightarrow (\neg C2W \wedge \neg C3W)$
$C1B \rightarrow (\neg C2B \wedge \neg C3B)$
$C2Y \rightarrow (\neg C1Y \wedge \neg C3Y)$
$C2W \rightarrow (\neg C1W \wedge \neg C3W)$
$C2B \rightarrow (\neg C1B \wedge \neg C3B)$
$C3Y \rightarrow (\neg C1Y \wedge \neg C2Y)$
$C3W \rightarrow (\neg C1W \wedge \neg C2W)$
$C3B \rightarrow (\neg C1B \wedge \neg C2B)$

2b.
Given:
O1Y,L1W,O2W,L2Y,O3Y,L3B
1. $O1Y \rightarrow (C1Y \vee C1B)$
2. $L1W \rightarrow C1Y \vee C1B$
3. $O2W \rightarrow (C2W \vee C2B)$
4. $L2Y \rightarrow C2W \vee C2B$
5. $O3Y \rightarrow (C3Y \vee C3B)$
6. $L3B \rightarrow C3W \vee C3Y$
7. This $\rightarrow$ C3Y since $(C3Y \vee C3B) \wedge (C3W \vee C3Y)$
8. $C3Y \rightarrow \neg C1Y \wedge \neg C2Y$ so C1B
9. $C1B \rightarrow \neg C2B \wedge \neg C3B$ so C2W

2c.
$\neg O1Y \lor C1Y \lor C1B$
$\neg O1W \lor C1W \lor C1B$
$\neg O2Y \lor C2Y \lor C2B$
$\neg O2W \lor C2W \lor C2B$
$\neg O3Y \lor C3Y \lor C3B$
$\neg O3W \lor C3W \lor C3B$
$\neg L1W \lor C1Y \lor C1B$
$\neg L1Y \lor C1W \lor C1B$
$\neg L1B \lor C1W \lor C1Y$
$\neg L2W \lor C2Y \lor C2B$
$\neg L2Y \lor C2W \lor C2B$
$\neg L2B \lor C2W \lor C2Y$
$\neg L3W \lor C3Y \lor C3B$
$\neg L3Y \lor C3W \lor C3B$
$\neg L3B \lor C3W \lor C3Y$
$(\neg C1Y \lor \neg C2Y) \land (\neg C1Y \lor \neg C3Y)$
$(\neg C1W \lor \neg C2W) \land (\neg C1W \lor \neg C3W)$
$(\neg C1B \lor \neg C2B) \land (\neg C1B \lor \neg C3B)$
$(\neg C2Y \lor \neg C1Y) \land (\neg C2Y \lor \neg C3Y)$
$(\neg C2W \lor \neg C1W) \land (\neg C2W \lor \neg C3W)$
$(\neg C2B \lor \neg C1B) \land (\neg C2B \lor \neg C3B)$
$(\neg C3Y \lor \neg C1Y) \land (\neg C3Y \lor \neg C2Y)$
$(\neg C3W \lor \neg C1W) \land (\neg C3W \lor \neg C2W)$
$(\neg C3B \lor \neg C1B) \land (\neg C3B \lor \neg C2B)$

2d.
Given:
O1Y,L1W,O2W,L2Y,O3Y,L3B

1. $O1Y \rightarrow C1Y \lor C1B$
2. $L1W \rightarrow C1Y \lor C1B$
3. $O2W \rightarrow C2W \lor C2B$
4. $L2Y \rightarrow C2W \lor C2B$
5. $O3Y \rightarrow C3Y \lor C3B$
6. $L3B \rightarrow C3W \lor C3Y$
7. $(C3Y \lor C3B)$ ^ $(C3W \lor C3Y) \rightarrow C3Y$
8. $\neg C2W \rightarrow C1W \lor C3W$
9. $C3Y \rightarrow \neg C3W$ so C1W
10. C1W contradicts $L1W \rightarrow C1Y \lor C1B$ (2) so the statement $\neg C2W$ is false, which means C2W

3.

Fact list:

1. Rainy
2. HaveMountainBike
3. EnjoyPlayingSoccer (not useful with the given KB)
4. WorkForUniversity (not useful with the given KB)
5. WorkCloseToHome
6. HaveMoney
7. HertzClosed (opposite of HertzOpen so not directly useful)
8. AvisOpen
9. McDonaldsOpen (not useful with the given KB)

From Fact 2 and Rule e: HaveBike (10)
From Fact 8 and Rule m: CarRentalOpen (11)
From Fact 6 and Fact 11 and Rule k: CanRentCar (12)
From Fact 12 and Rule j: CanDriveToWork (13)
From Fact 13 and Rule b: CanGetToWork (14)
List of inferred propositions:

1. HaveBike
2. CarRentalOpen
3. CanRentCar
4. CanDriveToWork
5. CanGetToWork

CanGetToWork is among them.

4.

1. GoalStack: CanGetToWork
2. GS: { CanBikeToWork, CanDriveToWork, CanWalkToWork } // pop CanGetToWork
3. GS: { HaveBike, WorkCloseToHome, Sunny, CanDriveToWork, CanWalkToWork } // pop CanBikeToWork
4. GS: { HaveMountainBike, Sunny, CanDriveToWork, CanWalkToWork} //PopHaveBike
5. GS: { WorkCloseToHome, Sunny, CanDriveToWork, CanWalkToWork} //Pop HaveMountainBike, fact
6. GS: { Sunny, CanDriveToWork, CanWalkToWork} // pop WorkCloseToHome, fact
7. GS: { CanDriveToWork, CanWalkToWork } // cant prove sunny, backtrack to other
8. GS: { OwnCar, CanRentCar, HaveMoney, TaxiAvailable, CanWalkToWork } // pop CanDriveToWork
9. GS: { CanRentCar, HaveMoney, TaxiAvailable, CanWalkToWork } // does not own car, backtrack
10. GS: { HaveMoney, CarRentalOpen, HaveMoney, TaxiAvailable, CanWalkToWork } // pop can rent car
11. GS: { CarRentalOpen, HaveMoney, TaxiAvailable, CanWalkToWork } // pop have money, fact

12. GS: { HertzOpen, AvisOpen, HaveMoney, TaxiAvailable, CanWalkToWork } //pop CarRentalOpen
13. GS: { AvisOpen, HaveMoney, TaxiAvailable, CanWalkToWork } // pop HertzOpen, false, backtrack
14. GS: { HaveMoney, TaxiAvailable, CanWalkToWork } // pop AvisOpen, fact, proves CanDriveToWork, CanGetToWork is proven true