Problem 1.

1. Initial state

STATE0 = [closed(mo), closed(ref), cl(mo),

in(chicken,ref), in(pizza, ref), in(book, ref)]

1. The list of goals

GOAL = [not\_hungry]

1. File states
2. File eat

* open(X)

PREC = [cl(X), closed(X)]

Eff+ = [opened(X)]

Eff- = [closed(X)]

* close(X)

PREC = [cl(X), opened(X)]

Eff+ = [closed(X)]

Eff- = [opened(X)]

* take(X, From)

PREC = [in(X,From), cl(From), opened(From)]

Eff+ = [has(X)]

Eff- = [in(X, From)]

* putIn(C, In)

PREC = [has(C), opened(In), cl(In)]

Eff+ = [in(C, In)]

Eff- = [has(C)]

* bake(X)

PREC = [in(X, mo), closed(mo), cl(mo)]

Eff+ = []

Eff- = []

* eat(X)

PREC = [has(X)]

Eff+ = [not\_hungry]

Eff- = [has(X)]

* move(To)

PREC = []

Eff+ = [cl(To)]

Eff- = []

1. use STRIPS planner

plan(State, Goals, Plan, FinalState)

Problem 2

1. in step 1, a path from A to B using an admissible heuristic function
2. in step 2, a path from A to B using a non-admissible heuristic function
3. in step 3, a path from A to B using an admissible heuristic function
4. in step 4, a path from A to B using a non- admissible heuristic function

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |  | **C** |  | X | X | X | X | X | X |
| X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |  |  |  |  |  |  |  |  |  |
| X |  |  |  |  |  |  |  |  |  |  |  |  |  | X | X |  | X |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| X | X | X |  | X |  |  |  | X |  |  |  | X | X |  |  |  |  | X |  | X | X | X |  | X |  |  |  |  | X | X | X |
| X |  |  |  |  |  |  |  |  |  |  |  | X |  | X | X | X |  | X | X |  | X | X |  | X |  |  |  |  |  |  |  |
| X |  | X |  |  |  | X | X | X |  | X | X | X |  |  |  | X | X |  |  | X | X |  |  |  |  |  |  | X | X |  |  |
|  |  | X | X |  |  |  |  |  | X | X | X | X |  |  |  |  |  | X | X |  |  | X | X | X |  |  | X |  |  |  | X |
| X | X | X | X |  |  |  |  |  |  |  |  |  |  | X | X | X |  |  |  |  |  |  |  |  |  |  |  |  |  | X | X |
|  |  |  |  |  |  |  |  |  | X | X | X |  |  | X |  |  |  |  |  |  | X |  |  |  | X |  |  | X | X |  | X |
|  | X | X | X |  |  |  |  |  |  |  |  |  |  | X | X |  |  |  |  |  |  |  | X |  |  | X |  |  |  |  |  |
|  | X |  | X | X | X | X | X |  |  |  |  |  |  |  |  | X |  |  |  |  | X | X |  |  |  | X | X |  |  |  |  |
|  |  |  |  |  |  |  | X | X | X |  |  |  |  |  |  |  |  | X | X | X | X | X | X |  |  |  |  |  | X |  |  |
| X | X | X | X | X |  | X | X | X |  | X | X | X | X |  |  |  | X | X | X | X | X | X | X |  |  |  | X | X |  |  |  |
| X | X | X | X | X |  |  |  |  | X | X | X | X |  |  |  |  | X | X | X | X | X | X | X |  |  |  | X | X | X | X | X |
| X | X | X | X | X | X |  |  |  |  |  | X |  |  |  |  |  | X | X | X | X | X | X | X |  |  |  |  | X | X |  |  |
| X | X | X | X | X | X |  | X |  |  |  |  |  |  |  | X | X | X | X | X | X | X | X | X |  |  |  |  |  |  |  |  |
|  | **A** |  |  | X |  | X | X | X | X |  |  |  |  | X | X | X | X | X | X | X | X |  |  | X | X |  |  | X | X | X | **B** |
| X | X | X | X |  |  |  |  |  |  |  |  |  |  |  |  | X | X | X | X |  |  |  | X | X | X |  |  | X | X | X |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | . | **C** | . | X | X | X | X | X | X |
| X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | . | . | . | . | . | . | . | . | . |
| X | . | . | . | . | . | . | . | . | . | . | . | . | . | X | X | . | X | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| X | X | X | . | X | . | . | . | X | . | . | . | X | X | . | . | . | . | X | . | X | X | X | . | X | . | . | . | . | X | X | X |
| X | . | . | . | . | . | . | . | . | . | . | . | X | . | X | X | X | . | X | X | . | X | X | . | X | . | . | . | . | . | . | . |
| X | . | X | . | . | . | X | X | X | . | X | X | X | . | . | . | X | X | . | . | X | X | . | . | . | . | . | . | X | X | . | . |
| . | . | X | X | . | . | . | . | . | X | X | X | X | . | . | . | . | . | X | X | . | . | X | X | X | . | . | X | . | . | . | X |
| X | X | X | X | . | . | . | . | . | . | . | . | . | . | X | X | X | . | . | . | . | . | . | . | . | . | . | . | . | . | X | X |
| . | . | . | . | . | . | . | . | . | X | X | X | . | . | X | . | . | . | . | . | . | X | . | . | . | X | . | . | X | X | . | X |
| . | X | X | X | . | . | . | . | . | . | . | . | . | . | X | X | . | . | . | . | . | . | . | X | . | . | X | . | . | . | . | . |
| . | X | . | X | X | X | X | X | . | . | . | . | . | . | . | . | X | . | . | . | . | X | X | . | . | . | X | X | . | . | . | . |
| . | . | . | . | . | . | . | X | X | X | . | . | . | . | . | . | . | . | X | X | X | X | X | X | . | . | . | . | . | X | . | . |
| X | X | X | X | X | . | X | X | X |  | X | X | X | X | . | . | . | X | X | X | X | X | X | X | . | . | . | X | X | . | . | . |
| X | X | X | X | X | . | . | . | . | X | X | X | X | . | . | . | . | X | X | X | X | X | X | X | . | . | . | X | X | X | X | X |
| X | X | X | X | X | X | . | . | . | . | . | X | . | . | . | . | . | X | X | X | X | X | X | X | . | . | . | . | X | X | . | . |
| X | X | X | X | X | X | . | X | . | . | . | . | . | . | . | X | X | X | X | X | X | X | X | X | . | . | . | . | . | . | . | . |
| . | **A** | . | . | X | . | X | X | X | X | . | . | . | . | X | X | X | X | X | X | X | X | . | . | X | X | . | . | X | X | X | **B** |
| X | X | X | X | . | . | . | . | . | . | . | . | . | . | . | . | X | X | X | X | . | . | . | X | X | X | . | . | X | X | X | . |

Let 10 be the moving cost of moving horizontally and vertically, 14 be the moving cost of movie diagonally.

Step 1. Admissible heuristic function

Heuristic(A) = 30

dx = abs(A.x - B.x) = 30

dy = abs(A.y - B.y) = 0

distance = sqrt(dx\*dx + dy\*dy) = 30

Step 2.non-admissible heuristic function

Heuristic(A) = 30

Dx = abs(A.x – B.x) = 30

Dy = abs(A.y – B.y) = 0

(Dx + Dy) = 30

Step 3. Admissible heuristic function

Heuristic(A) =

dx = abs(A.x - C.x) = 23

dy = abs(A.y - C.y) = 16

distance = sqrt(dx\*dx + dy\*dy) = sqrt(785) = 28

Step 4. Non- admissible heuristic function

Heuristic(C) = 39

Dx = abs(A.x – C.x) = 23

Dy = abs(A.y – C.y) = 16

(Dx + Dy) = 39