Exercise 24.1 from the textbook

Consider the Flights relation: Flights(fno, from, to, distance, departs, arrives).

Write the following queries in Datalog.

(a) Find the fno of all flights that depart from Madison.
(b) Find the fno of all flights that leave Chicago after Flight 101 arrives in Chicago and no later than 1 hour after.
(c) Find the fno of all flights that do not depart from Madison.
(d) Find all the cities reachable from Madison through a series of one or more connecting flights.
(e) Find all the cities reachable from Madison through a series of one or more connecting flights, with no more than 1 hour spent on any connection.
(f) Find the fno of all flights that do not depart from Madison or a city that is reachable from Madison through a chain of flights.

(a)
```
ans(fno):- Flights(fno, "Madison", _, _, _, _)
```

(b)
```
ans(fno):- Flights(101, _, "Chicago", _ , _, carrives),
Flights(fno, "Chicago", _, depart, _), depart > carrives,
carrives + 1hr < depart
```

(c)
```
ans(fno):- Flights(fno, from, to, dist, departs, arrives), not
Flights(fno, "Madison", to, dist, departs, arrives).
```

Note you need the first predicate to ensure that the query is safe, similarly, you need to name the rest of the variables to ensure that they're safe.

(d)
```
MadCity(to):- Flights(_,"Madison",to,_, _, _)
MadCity(to):- MadCity(from), Flights(_, from, to, _, _, _)
```

(e)
```
MadCity(to,arrive):- Flights(_,"Madison",to,_, _, arrive)
MadCity(to, arrives):- MadCity(from,prev_arrives), Flights(_,
from, to, _, departs, arrives), prev_arrives < departs,
prev_arrives + 1hr < departs
```

(f)
```
MadCity(to):- Flights(_,"Madison",to,_, _, _)
MadCity(to):- MadCity(from), Flights(_, from, to, _,_, _)
Ans(fno):- Flights(fno,from,to, _, _, _), not MadCity(from), not
Flights(fno,'Madison',to,_,_,_)
```