Review of the Current Schema and Potential Violations:

- **User:**
    - `user_id` (PK)
    - `first_name`
    - `last_name`
    - `email` (UNIQUE)
    - `password_hash`
    - `phone_number`
    - `role`
    - `created_at`

All non-key attributes directly depend on the primary key (`user_id`). There are no transitive dependencies. This table appears to be in 3NF.

- **Property:**
    - `property_id` (PK)
    - `host_id` (FK referencing User)
    - `name`
    - `description`
    - `location`
    - `price per night`
    - `created_at`
    - `updated_at`

All non-key attributes directly depend on the primary key (`property_id`). There are no transitive dependencies. This table appears to be in 3NF.

- **Booking:**
    - `booking_id` (PK)
    - `property_id` (FK referencing Property)
    - `user_id` (FK referencing User)
    - `start_date`
    - `end_date`
    - `total_price`
    - `status`
    - `created_at`

All non-key attributes directly depend on the primary key (`booking_id`). There are no transitive dependencies. This table appears to be in 3NF.

- **Payment:**
    - `payment_id` (PK)
    - `booking_id` (FK referencing Booking)
    - `amount`
    - `payment_date`
    - `payment_method`

All non-key attributes directly depend on the primary key (`payment_id`). There are no transitive dependencies. This table appears to be in 3NF.

- **Review:**
    - `review_id` (PK)
    - `property_id` (FK referencing Property)
    - `user_id` (FK referencing User)
    - `rating`
    - `comment`
    - `created_at`

All non-key attributes directly depend on the primary key (`review_id`). There are no transitive dependencies. This table appears to be in 3NF.

- **Message:**
    - `message_id` (PK)
    - `sender_id` (FK referencing User)
    - `recipient_id` (FK referencing User)
    - `message_body`
    - `sent_at`

All non-key attributes directly depend on the primary key (`message_id`). There are no transitive dependencies. This table appears to be in 3NF.

Explanation of Normalization to 3NF

1. **First Normal Form (1NF):**

    - Each column contains atomic (indivisible) values.
    - There are no repeating groups of columns.
    - Our current schema adheres to 1NF as each attribute holds a single value, and there are no repeating groups.
2. **Second Normal Form (2NF):**
    - The database must be in 1NF.
    - All non-key attributes must be fully functionally dependent on the entire primary key. This is only relevant for tables with composite primary keys. In our schema, most tables have a single-attribute primary key (UUIDs), so they inherently satisfy 2NF if they are in 1NF.
3. **Third Normal Form (3NF):**
    - The database must be in 2NF.
    - All non-key attributes must be non-transitively dependent on the primary key. This means that no non-key attribute should depend on another non-key attribute.

Why the Current Schema is in 3NF:

In each of our tables:

- Every non-key attribute provides information directly about the entity identified by the primary key. For example, in the `User` table, `first_name`, `last_name`, `email`, etc., all describe the specific user identified by `user_id`.
- There are no instances where a non-key attribute depends on another non-key attribute. For example, in the `Property` table, the `location` does not determine the `price per night`, and neither depends on the `name` or `description` directly (they all depend on the `property_id`).

Database Normalization to Third Normal Form (3NF)

Objective:To review the provided database schema and ensure it adheres to the Third Normal Form (3NF) by identifying and eliminating any redundancies or violations of normalization principles.

Review of the Current Schema:

Upon reviewing the schema for the `User`, `Property`, `Booking`, `Payment`, `Review`, and `Message` entities, i found that the current design already largely complies with the principles of 3NF. Each table was examined for adherence to 1NF, 2NF, and 3NF.

Analysis per Table:

User: All non-key attributes (`first_name`, `last_name`, `email`, etc.) are directly dependent on the primary key (`user_id`). No transitive dependencies were identified.

Property: All non-key attributes (`host_id`, `name`, `description`, `location`, `pricepernight`, `created_at`, `updated_at`) are directly dependent on the primary key (`property_id`). No transitive dependencies were identified.

Booking: All non-key attributes (`property_id`, `user_id`, `start_date`, `end_date`, `total_price`, `status`, `created_at`) are directly dependent on the primary key (`booking_id`). No transitive dependencies were identified.

Payment: All non-key attributes (`booking_id`, `amount`, `payment_date`, `payment_method`) are directly dependent on the primary key (`payment_id`). No transitive dependencies were identified.

Review: All non-key attributes (`property_id`, `user_id`, `rating`, `comment`, `created_at`) are directly dependent on the primary key (`review_id`). No transitive dependencies were identified.

Message: All non-key attributes (`sender_id`, `recipient_id`, `message_body`, `sent_at`) are directly dependent on the primary key (`message_id`). No transitive dependencies were identified.