

# Homework 1: Full-Stack Foundations (React, FastAPI, Tortoise ORM)

Due Thursday, October 9th, 2025

**Total Points: 100      Weight: 10% of Final Grade**

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## Multiple Choice (40 points, 4 pts each)

1. React is primarily used for:
  - 2 a) Styling web pages
  - 1 b) Building dynamic, component-based user interfaces
  - 3 c) Managing server-side routes
  - 4 d) Handling database migrations
  
2. In React, what is the correct way to create a component?
  - 2 a) `function MyComponent = { return <div>Hi</div> }`
  - 1 b) `function MyComponent() { return <div>Hi</div>; }`
  - 3 c) `component MyComponent() => <div>Hi</div>`
  - 4 d) `<component name="MyComponent">Hi</component>`
  
3. Which command starts a React development server when using Vite?
  - 1 a) `npm run dev`
  - 2 b) `npm start react`
  - 3 c) `vite run`
  - 4 d) `npx react`
  
4. In SQL, what does the SELECT keyword do?
  - 2 a) Modifies a table
  - 1 b) Retrieves data
  - 3 c) Deletes data
  - 4 d) Creates a new database
  
5. What is the main purpose of environment variables in Bash or FastAPI?
  - 3 a) Store project documentation
  - 1 b) Store configuration securely outside the code
  - 4 c) Manage frontend styling
  - 2 d) Control database indexes

6. Which command installs dependencies in a Node.js or React project?
- 1 a) npm install
  - 2 b) node run
  - 3 c) npx start
  - 4 d) npm server
7. Tortoise ORM is primarily used for:
- 3 a) Rendering HTML templates
  - 1 b) Managing database models in Python asynchronously
  - 2 c) Running SQL scripts manually
  - 4 d) Building front-end components
8. Which of the following drivers enables async PostgreSQL connections in FastAPI?
- 2 a) psycopg2
  - 1 b) asyncpg
  - 4 c) sqlite3
  - 3 d) mysqlclient
9. Which CSS framework offers utility-first classes for rapid custom UI design?
- 2 a) Bootstrap
  - 1 b) TailwindCSS
  - 4 c) jQueryUI
  - 3 d) Foundation
10. Which tool would you use to visually browse your PostgreSQL database?
- 1 a) pgAdmin
  - 3 b) MongoDB Compass
  - 4 c) RedisInsight
  - 2 d) SQLite Studio
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## True or False (10 points, 2 pts each)

- 1. React components must start with an uppercase letter. True
- 2. asyncpg is an asynchronous database driver for PostgreSQL. True
- 3. FastAPI routes can return HTML templates rendered with Jinja. True
- 4. Environment variables should not be committed to version control. True
- 5. jQuery is still useful for manipulating the DOM in projects without modern build tools. True

## Short Answer (15 points)

Answer in 3–5 sentences each.

1. React vs. jQuery – Explain how React's component model differs from jQuery's DOM manipulation approach. (5 pts)

React provides a higher level abstraction that organizes the UI into reusable components. jQuery is a set of utilities that directly manipulate the DOM elements. In short, React manages the UI function of the data while jQuery handles the DOM directly.

2. SQL vs. ORM – What's the advantage of using an ORM like Tortoise over writing raw SQL queries in FastAPI? (5 pts)

ORM like Tortoise lets you interact with your database using Python objects. Also, it is easier to maintain because of a simplified syntax and easier to manage. Writing raw SQL queries, on the other hand, can be harder to maintain because you need to write your SQL statements manually.

3. Good Website Design – List three characteristics that make a website "good" in terms of UX and performance. (5 pts)

The three characteristics that can make the website good in terms of UX and performance are fast loading speed, user-friendly, and clear navigation. These will make your website to be good in terms of UX and performance. Additionally, users can reach key content in a few clicks without confusion.

4. FastAPI Architecture – Describe how FastAPI handles requests and responses. Include the role of path operations and Pydantic models. (5 pts)

It handles request and responses using asynchronous. It uses `@app.get()` to define a path operation for GET and `@app.post()` for POST. FastAPI uses Pydantic models to validate both request and responses.

5. MongoDB vs. Postgres – When might you choose a NoSQL database like MongoDB instead of a relational one like Postgres?

MongoDB can be used big data where read/write performance are crucial. Also, when you have a nested data like user profiles etc.. Lastly, it stores data like JSON documents which makes it flexible.

## Code Review & Debug (20 points)

Review the following FastAPI+ TortoiseORMcode.

Identify five issues and explain why they're problematic and how to fix them. (4 pts each)

```
from fastapi import FastAPI
from tortoise import fields
from tortoise.models import Model

app = FastAPI()

class User(Model):
    id = fields.IntField(primary_key=True)
    username = fields.TextField(unique=True)
    password = fields.CharField()
    email = fields.CharField()

@app.post("/users")
async def create_user(username: str, password: str):
    user = User(username=username, password=password)
    await user.save()
    return user
```

Hints:

Think about missing Tortoise initialization, async context, model definition, and password handling.

The first issue that I have seen is that the Tortoise ORM is not initialize with the database URL and without initializing it will show no database connection error. Second, the password will store plain text password which is a risk of data exposure. To fix this, you need to use hashing. Third, the return user is a Tortoise model which can break a JSON serialization that is why using Pydantic models is a must for request/response. Fourth, without having a max\_length parameter, Tortoise will raise an error saying TypeError. Lastly, there is a missing input validation and Pydantic models must be use for input.

## Practical Setup (15 points)

Complete the following on your local system:

1. Install PostgreSQL, MongoDB, and Redis. Document the commands used and how you verified the services were running. (5 pts)
  2. Create a .env file with database credentials and load them safely using python-dotenv or Bash export. (5 pts)
  3. Initialize an npm React project (via Vite or CRA) and install Tailwind or Bootstrap. Include your package.json snippet. (5 pts)
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## Submission Guidelines

- Submit as PDF or Markdown file to github
- Include screenshots for the Practical Setup section.
- For the Code Review, clearly mark corrections with comments or revised code.
- Late submissions lose 10% per day unless pre-approved.