a) Write a brief explanation of React's core features: component-based architecture, Virtual DOM, and unidirectional data flow.

- **Component-Based Architecture**: React applications are built using reusable, self-contained components. Each component encapsulates its own logic, structure, and styling, making it easier to manage and maintain large applications. Components can be nested, reused, and composed to build complex UIs. This modular approach enhances maintainability and reusability of code.

- **Virtual DOM**: React uses a Virtual DOM to optimize rendering performance. Instead of directly manipulating the browser's DOM, React creates a lightweight copy of the DOM in memory. It updates only the changed elements instead of re-rendering the entire UI, making updates faster and improving performance.

- **Unidirectional Data Flow**: React enforces a one-way data flow, where data flows from parent components to child components via props, ensuring that changes in the application state propagate predictably, making debugging and managing state easier as data changes are easier to trace.

b) Discuss why these features make React ideal for building modern web applications.

- **Efficiency**: The Virtual DOM reduces unnecessary re-renders, leading to faster updates and a smoother user experience.
- **Scalability**: The component-based structure allows for easy scaling by breaking down the UI into smaller, manageable parts.
- **Maintainability**: Reusable components and modular architecture make applications easier to maintain and update.
- **Strong Ecosystem**: React has a vast community, extensive documentation, and a variety of third-party libraries that simplify development.
- **Predictability**: Unidirectional data flow makes the application's state management more predictable and easier to debug.