Assignment 1: Analyze a given business scenario and create an ER diagram that includes entities, relationships, attributes, and cardinality. Ensure that the diagram reflects proper normalization up to the third normal form.

Solution:

1. **Understand the Business Scenario**: Let's assume we have a business scenario for a simple e-commerce platform where customers can place orders for products. Each order can include multiple products, and each product can be part of multiple orders. Customers can have multiple addresses, but each address is associated with only one customer.

2. **Identify Entities**:

   - **Customer**
   - **Address**
   - **Order**
   - **Product**
   - **Order_Product** (a junction entity for the many-to-many relationship between Order and Product)

3. **Identify Relationships**:

   - **Customer - Address**: One-to-Many (A customer can have multiple addresses)
   - **Customer - Order**: One-to-Many (A customer can place multiple orders)
   - **Order - Order_Product**: One-to-Many (An order can contain multiple order products)
   - **Product - Order_Product**: One-to-Many (A product can be part of multiple order products)

4. **Identify Attributes**:

   - **Customer**: CustomerID (PK), FirstName, LastName, Email
   - **Address**: AddressID (PK), CustomerID (FK), Street, City, State, ZipCode
   - **Order**: OrderID (PK), CustomerID (FK), OrderDate, TotalAmount
   - **Product**: ProductID (PK), ProductName, Description, Price, Stock
   - **Order_Product**: OrderID (PK, FK), ProductID (PK, FK), Quantity, UnitPrice

5. **Define Cardinalities**:

   - **Customer - Address**: One customer can have multiple addresses, but each address belongs to one customer.
   - **Customer - Order**: One customer can have multiple orders, but each order belongs to one customer.
   - **Order - Order_Product**: One order can have multiple order products.
   - **Product - Order_Product**: One product can be part of multiple order products.

6. **Normalization**: Ensure all entities are in third normal form (3NF):

   - **1NF**: Ensure all attributes have atomic values.
   - **2NF**: Ensure no partial dependency (non-key attribute depends only on part of the primary key).
   - **3NF**: Ensure no transitive dependency (non-key attribute depends on another non-key attribute).