Consider the following interface definition representing a stack data structure:

```java
public interface Stack<T> {
    public void push(T item);
    public T pop() throws java.util.NoSuchElementException;
}
```

(a) Provide a non-thread-safe implementation of the interface. Apart from `NoSuchElementException` you may not use classes from the Standard Library. [8 marks]

(b) Provide and explain an example execution trace which demonstrates that your implementation is not thread safe. [6 marks]

(c) Define fine- and coarse-grained locking for thread safety. [2 marks]

(d) Describe how you would change your implementation to use a coarse-grained locking strategy. Explain why your example execution trace can no longer occur. [2 marks]

(e) Would there be any significant performance benefit from using a fine-grained locking strategy? Explain why. [2 marks]