7 Further Java (ARB+ACR)

Consider the following interface definition representing a stack data structure:

```
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]