Worksheet #25 (due by start of next lecture): Linearizability of method calls on a concurrent object

Name: _____ Netid: _____

Can you show an execution for which deq() results in an EmptyException in line 22 below? If so, that is a non-linearizable execution.

One Possible Attempt to Implement a Concurrent Queue

```
1.  // Assume that no. of enq() operations is < Integer.MAX_VALUE
2.  class Queue1 {
3.    AtomicInteger head = new AtomicInteger(0);
4.    AtomicInteger tail = new AtomicInteger(0);
5.    Object[] items = new Object[Integer.MAX_VALUE];
6.    public void enq(Object x) {
7.      int slot = tail.getAndIncrement(); // isolated(tail) ...
8.     items[slot] = x;
9.   } // enq
10.   public Object deq() throws EmptyException {
11.     int slot = head.getAndIncrement(); // isolated(head) ...
12.     Object value = items[slot];
13.     if (value == null) throw new EmptyException();
14.     return value;
15.   } // deq
16. } // Queue1

17. // Client code
18. finish {
19.   Queue1 q = new Queue1();
20.   async q.enq(new Integer(1));
21.   q.enq(newInteger(2));
22.   Integer x = (Integer) q.deq();
23. }
```