problem 1

```
kfarsany@andromeda-40 15:49:46 ~/hw/hw1
$ g++ hello.cpp
kfarsany@andromeda-40 15:49:50 ~/hw/hw1
$ valgrind a.out
==9967== Memcheck, a memory error detector
==9967== Copyright (C) 2002-2015, and GNU GPL'd, by Julian Seward et al.
==9967== Using Valgrind-3.12.0 and LibVEX; rerun with -h for copyright info
==9967== Command: a.out
==9967==
Hello World!
==9967==
==9967== HEAP SUMMARY:
==9967==     in use at exit: 72,704 bytes in 1 blocks
==9967==   total heap usage: 1 allocs, 0 frees, 72,704 bytes allocated
==9967==
==9967== LEAK SUMMARY:
==9967==    definitely lost: 0 bytes in 0 blocks
==9967==    indirectly lost: 0 bytes in 0 blocks
==9967==      possibly lost: 0 bytes in 0 blocks
==9967==    still reachable: 72,704 bytes in 1 blocks
==9967==         suppressed: 0 bytes in 0 blocks
==9967== Rerun with --leak-check=full to see details of leaked memory
==9967==
==9967== For counts of detected and suppressed errors, rerun with: -v
==9967== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
kfarsany@andromeda-40 15:49:54 ~/hw/hw1
$
```

problem 2

```
kfarsany@andromeda-40 15:50:13 ~/hw/hw1
[$ g++ convert_knots.cpp
kfarsany@andromeda-40 15:50:19 ~/hw/hw1
[$ valgrind a.out
==9990== Memcheck, a memory error detector
==9990== Copyright (C) 2002-2015, and GNU GPL'd, by Julian Seward et al.
==9990== Using Valgrind-3.12.0 and LibVEX; rerun with -h for copyright info
==9990== Command: a.out
==9990==
1
0.0191793
==9990==
==9990== HEAP SUMMARY:
==9990==     in use at exit: 72,704 bytes in 1 blocks
==9990==   total heap usage: 1 allocs, 0 frees, 72,704 bytes allocated
==9990==
==9990== LEAK SUMMARY:
==9990==    definitely lost: 0 bytes in 0 blocks
==9990==    indirectly lost: 0 bytes in 0 blocks
==9990==      possibly lost: 0 bytes in 0 blocks
==9990==    still reachable: 72,704 bytes in 1 blocks
==9990==         suppressed: 0 bytes in 0 blocks
==9990== Rerun with --leak-check=full to see details of leaked memory
==9990==
==9990== For counts of detected and suppressed errors, rerun with: -v
==9990== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
kfarsany@andromeda-40 15:50:25 ~/hw/hw1
[$ valgrind a.out
==9991== Memcheck, a memory error detector
==9991== Copyright (C) 2002-2015, and GNU GPL'd, by Julian Seward et al.
==9991== Using Valgrind-3.12.0 and LibVEX; rerun with -h for copyright info
==9991== Command: a.out
==9991==
5
0.0958965
==9991==
==9991== HEAP SUMMARY:
==9991==     in use at exit: 72,704 bytes in 1 blocks
==9991==   total heap usage: 1 allocs, 0 frees, 72,704 bytes allocated
==9991==
==9991== LEAK SUMMARY:
==9991==    definitely lost: 0 bytes in 0 blocks
==9991==    indirectly lost: 0 bytes in 0 blocks
==9991==      possibly lost: 0 bytes in 0 blocks
==9991==    still reachable: 72,704 bytes in 1 blocks
==9991==         suppressed: 0 bytes in 0 blocks
==9991== Rerun with --leak-check=full to see details of leaked memory
==9991==
==9991== For counts of detected and suppressed errors, rerun with: -v
==9991== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
kfarsany@andromeda-40 15:50:33 ~/hw/hw1
$
```

problem 3

```
kfarsany@andromeda-40 15:51:06 ~/hw/hw1
[$ g++ test_stack.cpp
kfarsany@andromeda-40 15:51:17 ~/hw/hw1
[$ valgrind a.out
==10040== Memcheck, a memory error detector
==10040== Copyright (C) 2002-2015, and GNU GPL'd, by Julian Seward et al.
==10040== Using Valgrind-3.12.0 and LibVEX; rerun with -h for copyright info
==10040== Command: a.out
==10040==
[Hello World
dlroW olleH
[123456789
987654321
[123456789987654321
123456789987654321
[abcdefghijkl...
...lkjihgfedcba
==10040==
==10040== HEAP SUMMARY:
==10040==     in use at exit: 72,704 bytes in 1 blocks
==10040==   total heap usage: 2 allocs, 1 frees, 72,735 bytes allocated
==10040==
==10040== LEAK SUMMARY:
==10040==    definitely lost: 0 bytes in 0 blocks
==10040==    indirectly lost: 0 bytes in 0 blocks
==10040==      possibly lost: 0 bytes in 0 blocks
==10040==    still reachable: 72,704 bytes in 1 blocks
==10040==         suppressed: 0 bytes in 0 blocks
==10040== Rerun with --leak-check=full to see details of leaked memory
==10040==
==10040== For counts of detected and suppressed errors, rerun with: -v
==10040== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
kfarsany@andromeda-40 15:51:49 ~/hw/hw1
$ 
```