תרגיל 1:

1. צירפנו את הקבצים : stackOverflow.cpp , divByZero.cpp
undefinedMemory.cpp ובנוסף קובץ Makefile עם דגל g- ובלי דגל g-.

2. <u>פתיחת core שנוצר בעזרת דגל g-:</u>

```
nitzan@nitzan-VirtualBox:~/Desktop/OS_EX1/q1$ ./divByZero
Floating point exception (core dumped)
nitzan@nitzan-VirtualBox:~/Desktop/OS_EX1/q1$ ./stackOverflow
Segmentation fault (core dumped)
nitzan@nitzan-VirtualBox:~/Desktop/OS_EX1/q1$ ./undefinedMemory
Segmentation fault (core dumped)
nitzan@nitzan-VirtualBox:~/Desktop/OS_EX1/q1$ find . -type f -name 'core*'
./core.6313
./core.6340
./core.6331
```

3. <u>פתחנו את הקובץ divByZero כאשר יש דגל:</u>

```
nitzan@nitzan-VirtualBox:~/Desktop/OS_EX1/q1$ gdb ./divByZero core.6313
GNU gdb (Ubuntu 12.1-0ubuntu1~22.04.2) 12.1
Copyright (C) 2022 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.
Type "show copying" and "show warranty" for details.
This GDB was configured as "x86_64-linux-gnu".
Type "show configuration" for configuration details.
For bug reporting instructions, please see:
<https://www.gnu.org/software/gdb/bugs/>.
Find the GDB manual and other documentation resources online at:
    <http://www.gnu.org/software/gdb/documentation/>.

For help, type "help".
Type "apropos word" to search for commands related to "word"...
Reading symbols from ./divByZero...
[New LWP 6313]
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".
Core was generated by `./divByZero'.
Program terminated with signal SIGFPE, Arithmetic exception.
#0  0x00005aaa2a53713d in div (num=2) at divByZero.cpp:5
5           return num/0;
```

השתמשנו בפקודת where:

```
(gdb) where
#0  0x00005aaa2a53713d in div (num=2) at divByZero.cpp:5
#1  0x00005aaa2a53715e in main () at divByZero.cpp:9
```

כעת נדגים אותו הדבר בשאר הקבצים:

בקובץ stackOverflow:

```
Core was generated by `./stackOverflow'.
Program terminated with signal SIGSEGV, Segmentation fault.
#0  0x000058dcb259c135 in recursive (
    num=<error reading variable: Cannot access memory at address 0x7fff089eaffc>
) at stackOverflow.cpp:6
6           int recursive(int num) {
(gdb) where
#0  0x000058dcb259c135 in recursive (
    num=<error reading variable: Cannot access memory at address 0x7fff089eaffc>
) at stackOverflow.cpp:6
#1  0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#2  0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#3  0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#4  0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#5  0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#6  0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#7  0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#8  0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#9  0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#10 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#11 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#12 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#13 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#14 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#15 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#16 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#17 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#18 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#19 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#20 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#21 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#22 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
#23 0x000058dcb259c142 in recursive (num=5) at stackOverflow.cpp:7
--Type <RET> for more, q to quit, c to continue without paging--
```

בקובץ undefinedMemory:

```
Reading symbols from ./undefinedMemory...
[New LWP 6340]
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".
Core was generated by `./undefinedMemory'.
Program terminated with signal SIGSEGV, Segmentation fault.
#0  0x0000591eb601813e in main () at undefinedMemory.cpp:7
7           *pointer = 2;
(gdb) where
#0  0x0000591eb601813e in main () at undefinedMemory.cpp:7
(gdb) print pointer
$1 = (int *) 0xdeadbeef
(gdb) print *pointer
Cannot access memory at address 0xdeadbeef
```
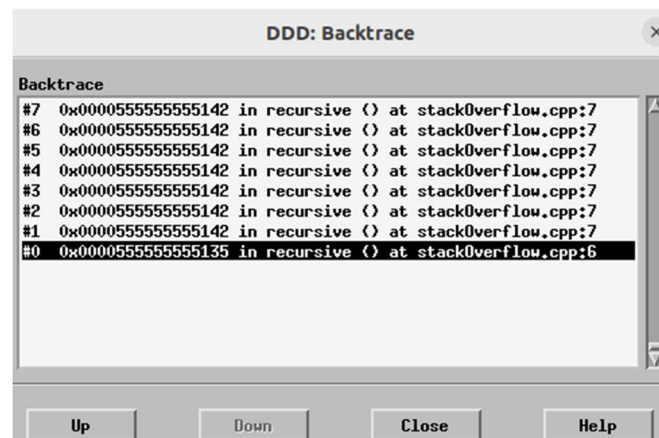
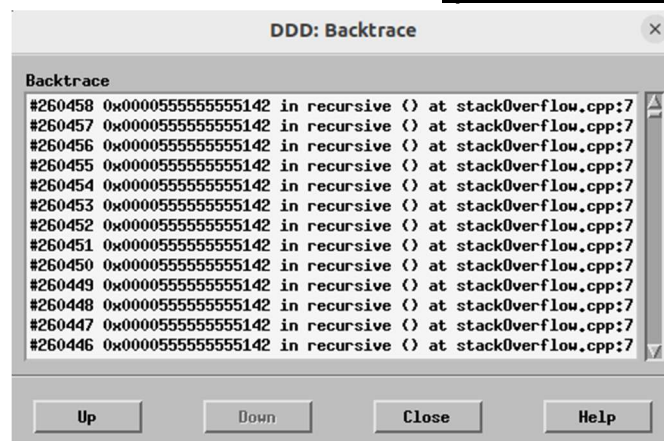## 4. כעת נפתח את ה-core בעזרת debugger גרפי, על הקבצים שיצרנו עם הדגל:
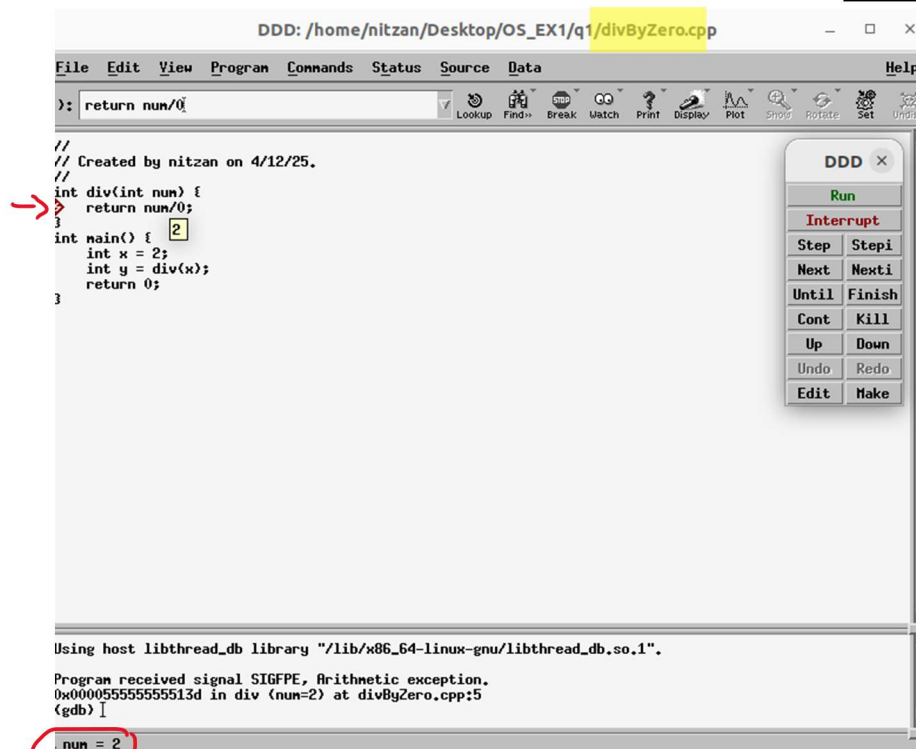
ניתן לראות, שערך num רשום למטה, וישנו חץ אדום המצביע היכן התכנית קרסה.
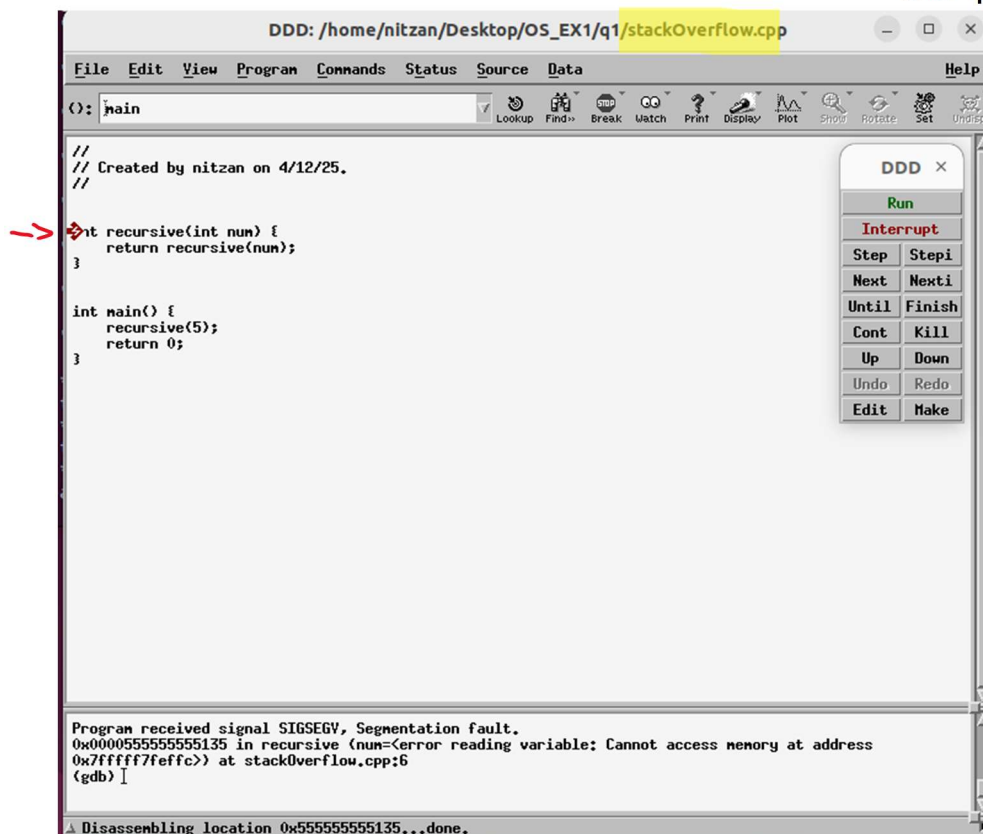
בbacktrace←status פתחנו את כלל הקריאות , וניתן לראות כיצד המחסנית מתמלאת:

לאחר מספר דק:

כאשר לחצנו על display:

כעת ניצור את קבצי ה core , בקימפול ללא דגלי debug:

כעת נפתח את קבצי ה core בעזרת gdb:

1. divByZero:

```
Reading symbols from ./divByZero...
(No debugging symbols found in ./divByZero)
[New LWP 6683]
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".
Core was generated by `./divByZero'.
Program terminated with signal SIGFPE, Arithmetic exception.
#0  0x0000570aff1b113d in div(int) ()
(gdb) where
#0  0x0000570aff1b113d in div(int) ()
#1  0x0000570aff1b115e in main ()
```

2. stackOverflow:

```
Reading symbols from ./stackOverflow...
(No debugging symbols found in ./stackOverflow)
[New LWP 6692]
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".
Core was generated by `./stackOverflow'.
Program terminated with signal SIGSEGV, Segmentation fault.
#0  0x000059460828913d in recursive(int) ()
(gdb) where
#0  0x000059460828913d in recursive(int) ()
#1  0x0000594608289142 in recursive(int) ()
#2  0x0000594608289142 in recursive(int) ()
#3  0x0000594608289142 in recursive(int) ()
#4  0x0000594608289142 in recursive(int) ()
#5  0x0000594608289142 in recursive(int) ()
#6  0x0000594608289142 in recursive(int) ()
#7  0x0000594608289142 in recursive(int) ()
#8  0x0000594608289142 in recursive(int) ()
#9  0x0000594608289142 in recursive(int) ()
#10 0x0000594608289142 in recursive(int) ()
#11 0x0000594608289142 in recursive(int) ()
#12 0x0000594608289142 in recursive(int) ()
#13 0x0000594608289142 in recursive(int) ()
#14 0x0000594608289142 in recursive(int) ()
#15 0x0000594608289142 in recursive(int) ()
#16 0x0000594608289142 in recursive(int) ()
#17 0x0000594608289142 in recursive(int) ()
#18 0x0000594608289142 in recursive(int) ()
```

3. undefinedMemory:

```
Reading symbols from ./undefinedMemory...
(No debugging symbols found in ./undefinedMemory)
[New LWP 6696]
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".
Core was generated by `./undefinedMemory'.
Program terminated with signal SIGSEGV, Segmentation fault.
#0  0x0000592b88f2d13e in main ()
(gdb) where
#0  0x0000592b88f2d13e in main ()
(gdb) print pointer
No symbol "pointer" in current context.
(gdb) print *pointer
No symbol "pointer" in current context.
(gdb)
```

כפי שניתן לראות. מכיוון שלא השתמשנו ב debugging infos לא היה ניתן
לראות במקרים אלו , את ערכי המשתנים והיכן בדיוק קרתה הקריסה.
ניסינו לפתוח ddd (דיבאגר גרפי) אך ללא דגל g- הפתיחה אינה מוצלחת
ולא מוצג לנו המידע כראוי.