

מטלה במערכות הפעלה

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שירתנו ביחד 4 ימי מילואים, ולכן מטלה זו הוגשה באיחור של יומיים – בהתאם להנחיות.

שאלה 1

דוגמאות הרצה ללא Debug info:

Division By Zero

```
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q1$ gdb ./DivisionByZeroException /mnt/wslg/dumps/core.DivisionByZeroE
GNU gdb (Ubuntu 15.0.50.20240403-0ubuntu1) 15.0.50.20240403-git
Copyright (C) 2024 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:
<http://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 ./DivisionByZeroException...

This GDB supports auto-downloading debuginfo from the following URLs:
<https://debuginfod.ubuntu.com>
Enable debuginfod for this session? (y or [n]) n
Debuginfod has been disabled.
To make this setting permanent, add 'set debuginfod enabled off' to .gdbinit.
(No debugging symbols found in ./DivisionByZeroException)

warning: core file may not match specified executable file.
[New LWP 60595]
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".
Core was generated by './DivisionByZeroException'.
Program terminated with signal SIGFPE, Arithmetic exception.
#0  0x0000561be14d813c in main ()
(gdb) p main
$1 = [text variable, no debug info] 0x561be14d8129 <main>
(gdb) where
#0  0x0000561be14d813c in main ()
(gdb)
```

Stack Overflow Exception

```
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q1$ gdb ./StackOverflowException /mnt/wslg/dumps/core.StackOverflowEx
Segmentation fault (core dumped)
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q1$ gdb ./StackOverflowException /mnt/wslg/dumps/core.StackOverflowEx
GNU gdb (Ubuntu 15.0.50.20240403-0ubuntu1) 15.0.50.20240403-git
Copyright (C) 2024 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:
<http://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 ./StackOverflowException...

This GDB supports auto-downloading debuginfo from the following URLs:
<https://debuginfod.ubuntu.com>
Enable debuginfod for this session? (y or [n]) n
Debuginfod has been disabled.
To make this setting permanent, add 'set debuginfod enabled off' to .gdbinit.
(No debugging symbols found in ./StackOverflowException)
[New LWP 65286]
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".
Core was generated by './StackOverflowException'.
Program terminated with signal SIGSEGV, Segmentation fault.
#0  0x0000562f6553b131 in infiniteRecursion() ()
(gdb) where
#0  0x0000562f6553b131 in infiniteRecursion() ()
#1  0x0000562f6553b130 in infiniteRecursion() ()
#2  0x0000562f6553b130 in infiniteRecursion() ()
#3  0x0000562f6553b130 in infiniteRecursion() ()
#4  0x0000562f6553b130 in infiniteRecursion() ()
#5  0x0000562f6553b130 in infiniteRecursion() ()
#6  0x0000562f6553b130 in infiniteRecursion() ()
#7  0x0000562f6553b130 in infiniteRecursion() ()
```


:Undefined Memory

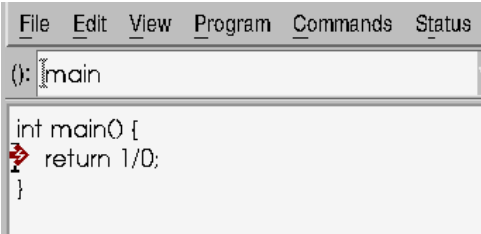
```
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q1$ ./UndefinedMemoryException
Segmentation fault (core dumped)
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q1$ gdb ./UndefinedMemoryException /mnt/wslg/dumps/core.UndefinedMemory
GNU gdb (Ubuntu 15.0.50.20240403-0ubuntu1) 15.0.50.20240403-git
Copyright (C) 2024 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 ./UndefinedMemoryException...
[New LWP 65395]

This GDB supports auto-downloading debuginfo from the following URLs:
  <https://debuginfod.ubuntu.com>
Enable debuginfod for this session? (y or [n]) n
Debuginfod has been disabled.
To make this setting permanent, add 'set debuginfod enabled off' to .gdbinit.
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".
Core was generated by './UndefinedMemoryException'.
Program terminated with signal SIGSEGV, Segmentation fault.
#0  main () at UndefinedMemoryException.cpp:5
5      return *(int *)NULL;
(gdb) where
#0  main () at UndefinedMemoryException.cpp:5
(gdb)
```

:הרצה באמצעות ממשק גרפי (DDD)

:Division By Zero



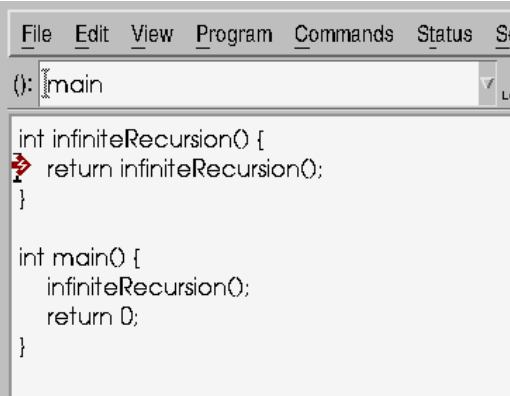
The screenshot shows the DDD interface with a menu bar (File, Edit, View, Program, Commands, Status) and a toolbar. The main window displays the source code of a C++ program. The code is as follows:

```
() : main

int main() {
    return 1/0;
}
```

A red error icon is visible next to the `return 1/0;` line, indicating a runtime error (division by zero).

:Stack Overflow



The screenshot shows the DDD interface with a menu bar (File, Edit, View, Program, Commands, Status) and a toolbar. The main window displays the source code of a C++ program. The code is as follows:

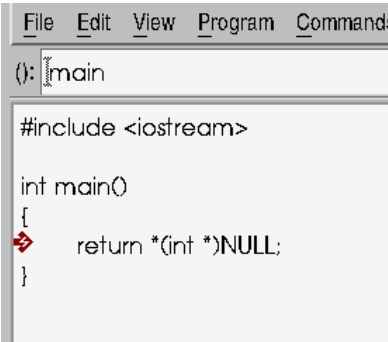
```
() : main

int infiniteRecursion() {
    return infiniteRecursion();
}

int main() {
    infiniteRecursion();
    return 0;
}
```

A red error icon is visible next to the `return infiniteRecursion();` line in the `infiniteRecursion()` function, indicating a runtime error (stack overflow).

:Undefined Memory



The screenshot shows the DDD interface with a menu bar (File, Edit, View, Program, Commands) and a toolbar. The main window displays the source code of a C++ program. The code is as follows:

```
() : main

#include <iostream>

int main()
{
    return *(int *)NULL;
}
```

A red error icon is visible next to the `return *(int *)NULL;` line, indicating a runtime error (undefined memory access).

תרגיל 2:

דוגמת הרצה:

```
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q2$ ./Poisson 2 1
Pr(X = 1) = 0.270671
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q2$ ./Poisson 2 10
Pr(X = 10) = 3.81899e-05
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q2$ ./Poisson 2 2
Pr(X = 2) = 0.270671
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q2$ ./Poisson 3 3
Pr(X = 3) = 0.224042
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q2$ ./Poisson 100 3
Pr(X = 3) = 6.30584e-39
```

תרגיל 3:

דוגמת הרצה:

```
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q3$ ./main
For X~Poi(2), Pr(X = 1) = 0.270671
For X~Poi(2), Pr(X = 10) = 3.81899e-05
For X~Poi(2), Pr(X = 2) = 0.270671
For X~Poi(3), Pr(X = 3) = 0.224042
For X~Poi(100), Pr(X = 3) = 6.30584e-39
```

תרגיל 4:

דוגמת הרצה

```
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q4$ ./main
Enter the weight of the edges from vertex 0:
0 3 1 0
Enter the weight of the edges from vertex 1:
3 0 3 0
Enter the weight of the edges from vertex 2:
1 3 0 3
Enter the weight of the edges from vertex 3:
0 0 3 0
Vertex Distance from Source
0 0
1 3
2 1
3 4
```

דוגמת ההרצה הנ"ל בוצעה על מטריצת השכנויות של הגרף הבא (כאשר קודקוד 1 הוא קודקוד 0 בדוגמת ההרצה):



Code Coverage

עבור החלק הזה כתבנו rule שיריץ את קובץ הבדיקות ולאחר מכן ידפיס את libdijkstra.cpp.gcov (מצוין בהמשך):

```
uriel@LinuxVM:~/VS Code Programs/Operatin Systems - Ex1/Q4$ make run
make all
make[1]: Entering directory '/home/uriel/VS Code Programs/Operatin Systems - Ex1/Q4'
make[1]: Nothing to be done for 'all'.
make[1]: Leaving directory '/home/uriel/VS Code Programs/Operatin Systems - Ex1/Q4'
./test
[doctest] doctest version is "2.4.11"
[doctest] run with "--help" for options
Enter the weight of the edges from vertex 0:
Enter the weight of the edges from vertex 1:
Enter the weight of the edges from vertex 2:
Enter the weight of the edges from vertex 0:
Enter the weight of the edges from vertex 1:
Enter the weight of the edges from vertex 2:
Enter the weight of the edges from vertex 3:
Enter the weight of the edges from vertex 0:
Enter the weight of the edges from vertex 0:
Enter the weight of the edges from vertex 0:
Enter the weight of the edges from vertex 1:
Enter the weight of the edges from vertex 0:
Enter the weight of the edges from vertex 1:
=====
[doctest] test cases: 10 | 10 passed | 0 failed | 0 skipped
[doctest] assertions: 47 | 47 passed | 0 failed |
[doctest] Status: SUCCESS!
gcov libdijkstra.cpp
File 'libdijkstra.cpp'
Lines executed:100.00% of 60
Creating 'libdijkstra.cpp.gcov'
```

על מנת לבדוק את הקוד, נדרש לכתוב את הפקודה "make run" ב-shell, שתבצע את הפעולות הבאות:

ביצוע make לכל ה-rules.

הרצת קובץ ה-Test.

הפעלת gcov על קובץ ה-cpp של הספרייה (מה שיצור לנו קובץ cpp.gcov של הספרייה).

הדפסת הקובץ ע"מ לראות אילו שורות לא בוצעו.

run:

```
make all
./$(TEST_MAIN)
gcov $(LIB).cpp
cat $(LIB).cpp.gcov
make clean
```

"ניקיון" כל הקבצים שאינם נדרשים (gcov, gcda, o).

שאלה 5:

דוגמת הרצה:

```
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q5$ make profile
mkdir -p results
./main_n 100 100
The result is 2400
gprof ./main_n > results/n_100.txt
./main_n 1000 1000
The result is 23135
gprof ./main_n > results/n_1000.txt
./main_n 10000 10000
The result is 247322
gprof ./main_n > results/n_10000.txt
./main_n2 100 100
The result is 2400
gprof ./main_n2 > results/n2_100.txt
./main_n2 1000 1000
The result is 23135
gprof ./main_n2 > results/n2_1000.txt
./main_n2 10000 10000
The result is 247322
gprof ./main_n2 > results/n2_10000.txt
./main_n3 100 100
The result is 2400
gprof ./main_n3 > results/n3_100.txt
./main_n3 1000 1000
The result is 23135
gprof ./main_n3 > results/n3_1000.txt
./main_n3 10000 10000
The result is 247322
gprof ./main_n3 > results/n3_10000.txt
```

שאלה 6:

דוגמת הרצה:

```
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q6$ ./add2PB Uriel, 050500333
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q6$ ./add2PB Uriel Shapiro, 0534654687
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q6$ ./add2PB Chaim, 054684868
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q6$ ./add2PB Chaim Averbach, 05286
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q6$ cat phonebook.txt
Uriel, 050500333
Uriel Shapiro, 0534654687
Chaim, 054684868
Chaim Averbach, 05286
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q6$ ./findPhone Uriel
Found number(s) for names matching "Uriel": 050500333 0534654687
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q6$ ./findPhone Shapiro
Found number(s) for names matching "Shapiro": 0534654687
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q6$ ./findPhone Averbach
Found number(s) for names matching "Averbach": 05286
uriel@LAPTOP-733304ND:~/Desktop/VSCode/OperatingSystems_Ex1/Q6$ ./findPhone Unknown
Found number(s) for names matching "Unknown": Name not found
```