Q1) 0xfffef094

```
0xff7bca40 in ?? ()
(gdb) b main
Breakpoint 1 at 0x10414: file P4.c, line 11.
(gdb) c
Continuing.
warning: Could not load shared library symbols for 2 libraries, e.g. /lib/libc.s
o.6.
Use the "info sharedlibrary" command to see the complete listing.
Do you need "set solib-search-path" or "set sysroot"?

Breakpoint 1, main () at P4.c:11
11              int i = 8;
(gdb) n
12              recurse(i);
(gdb) s
recurse (i=8) at P4.c:4
4         if (i == 0)
(gdb) n
7               recurse(i - 1);
(gdb) display i
1: i = 8
(gdb) s
recurse (i=7) at P4.c:4
4         if (i == 0)
1: i = 7
(gdb) n
7               recurse(i - 1);
1: i = 7
(gdb) s
recurse (i=6) at P4.c:4
4         if (i == 0)
1: i = 6
(gdb) n
7               recurse(i - 1);
1: i = 6
(gdb) s
recurse (i=5) at P4.c:4
4         if (i == 0)
1: i = 5
(gdb) display &i
2: &i = (int *) 0xfffef094
(gdb)
```

Q2) 12 bytes
By converting into hexadecimal,
0xfffef0a0 - 0xfffef09c = 12 bytes

```
(gdb) s
recurse (i=8) at P4.c:4
4          if (i == 0)
(gdb) n
7                recurse(i - 1);
(gdb) display i
1: i = 8
(gdb) s
recurse (i=7) at P4.c:4
4          if (i == 0)
1: i = 7
(gdb) n
7                recurse(i - 1);
1: i = 7
(gdb) s
recurse (i=6) at P4.c:4
4          if (i == 0)
1: i = 6
(gdb) n
7                recurse(i - 1);
1: i = 6
(gdb) s
recurse (i=5) at P4.c:4
4          if (i == 0)
1: i = 5
(gdb) display &i
2: &i = (int *) 0xfffef094
(gdb) info frame
Stack level 0, frame at 0xfffef0a0:
 pc = 0x103d8 in recurse (P4.c:4); saved pc = 0x103fc
 called by frame at 0xfffef0b0
 source language c.
 Arglist at 0xfffef09c, args: i=5
 Locals at 0xfffef09c, Previous frame's sp is 0xfffef0a0
 Saved registers:
  r11 at 0xfffef098, lr at 0xfffef09c
(gdb) info locals
No locals.
(gdb) x/16x 0xfffef09c
0xfffef09c:     0x000103fc      0xff7a8000      0x00000006      0xfffef0bc
0xfffef0ac:     0x000103fc      0xff7a7080      0x00000007      0xfffef0cc
0xfffef0bc:     0x000103fc      0x00010434      0x00000008      0xfffef0dc
0xfffef0cc:     0x00010424      0x00000000      0x00000008      0x00000000
(gdb)
```

Q3) Register: r0, Location: 0x4

```
7                recurse(i - 1);
1: i = 7
2: &i = (int *) 0xfffef074
(gdb) sn
Undefined command: "sn".  Try "help".
(gdb) s
recurse (i=6) at P4.c:4
4           if (i == 0)
1: i = 6
2: &i = (int *) 0xfffef064
(gdb) n
7                recurse(i - 1);
1: i = 6
2: &i = (int *) 0xfffef064
(gdb) s
recurse (i=5) at P4.c:4
4           if (i == 0)
1: i = 5
2: &i = (int *) 0xfffef054
(gdb) n
7                recurse(i - 1);
1: i = 5
2: &i = (int *) 0xfffef054
(gdb) s
recurse (i=4) at P4.c:4
4           if (i == 0)
1: i = 4
2: &i = (int *) 0xfffef044
(gdb) info registers
r0             0x4                    4
r1             0xfffef234             -69068
r2             0xfffef23c             -69060
r3             0x4                    4
r4             0x10434                66612
r5             0x0                    0
r6             0x102d8                66264
r7             0x0                    0
r8             0x0                    0
r9             0x0                    0
r10            0xff7ee000             -8462336
r11            0xfffef04c             -69556
r12            0xfffef158             -69288
sp             0xfffef040             0xfffef040
lr             0x103fc                66556
pc             0x103d8                0x103d8 <recurse+16>
(gdb) info frame
Stack level 0, frame at 0xfffef050:
 pc = 0x103d8 in recurse (P4.c:4); saved pc = 0x103fc
 called by frame at 0xfffef060
 source language c.
 Arglist at 0xfffef04c, args: i=4
 Locals at 0xfffef04c, Previous frame's sp is 0xfffef050
 Saved registers:
  r11 at 0xfffef048, lr at 0xfffef04c
(gdb) print $r0
$1 = 4
```
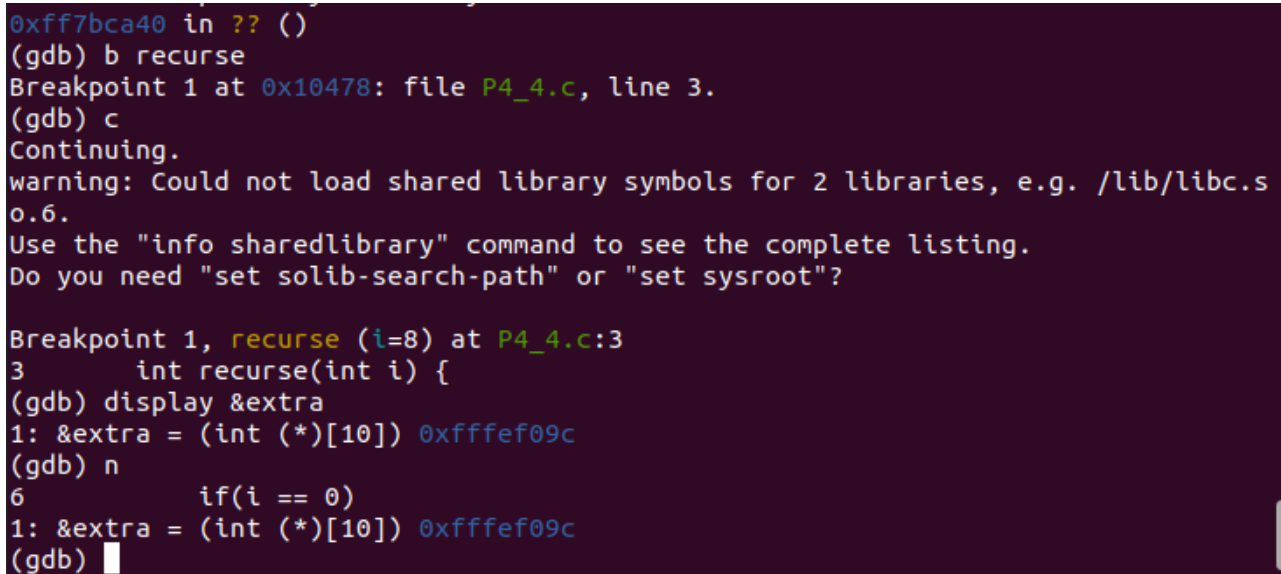
Q4)
```c
#include <stdio.h>

int recurse(int i) {
    int extra[10];  // Allocate 10 integers (10 * 4 bytes = 40 bytes)

    if(i == 0)
        return 0;
    else
        recurse(i - 1);
}

int main() {
    int i = 8;
    recurse(i);
}
```

```
0xff7bca40 in ?? ()
(gdb) b recurse
Breakpoint 1 at 0x10478: file P4_4.c, line 3.
(gdb) c
Continuing.
warning: Could not load shared library symbols for 2 libraries, e.g. /lib/libc.s
o.6.
Use the "info sharedlibrary" command to see the complete listing.
Do you need "set solib-search-path" or "set sysroot"?

Breakpoint 1, recurse (i=8) at P4_4.c:3
3        int recurse(int i) {
(gdb) display &extra
1: &extra = (int (*)[10]) 0xfffef09c
(gdb) n
6            if(i == 0)
1: &extra = (int (*)[10]) 0xfffef09c
(gdb)
```

Starting Address location: 0xfffef09c