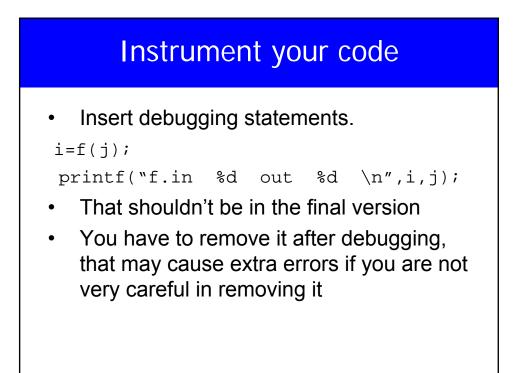


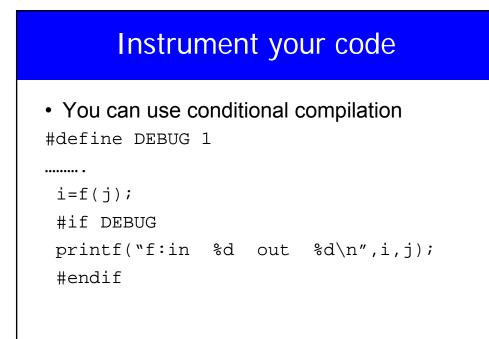
# Testing

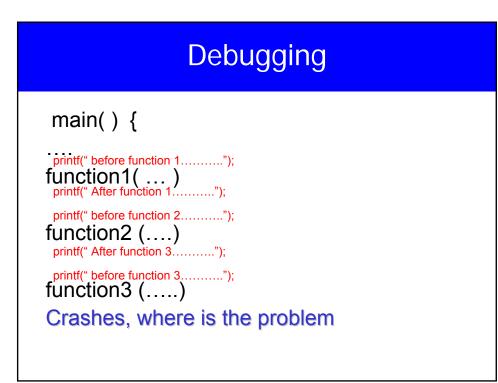
- You wrote your program, compiled it (correcting syntax errors), ran it, and tested it, but it failed, what to do?
- There is a bug somewhere, to remove it we have to know where is it first.
- After finding it, remove/correct it changing as little code as possible to minimize introducing new bugs.

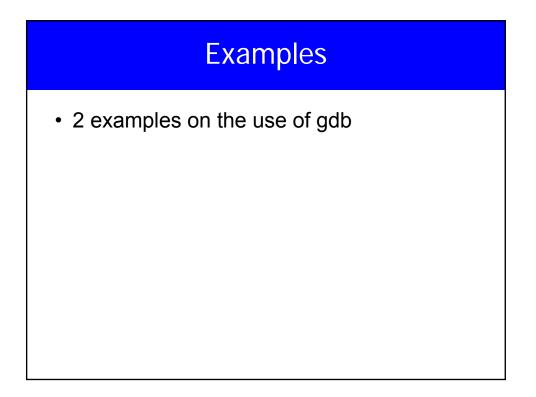
## Testing/Debugging

- Testing to find out as many things about the problem as possible
- · Try to isolate the bug, what caused it
- · Correct it. After that
  - Test to see if the problem is solved
  - Every thing that worked before is working
  - No new errors are introduced

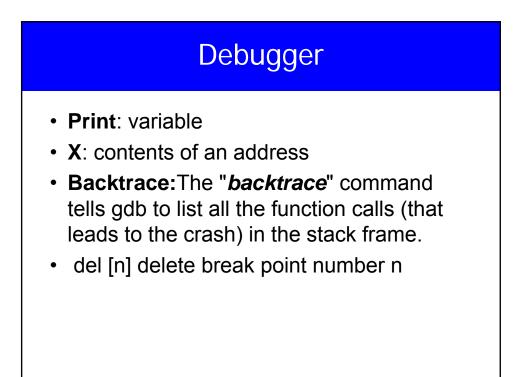








# Debugger Next Advance one statement, do not step into calls. Step Advance one statement in the program. List show your program. Run run Break line number, function name, fun:line



#### **Common Crash Causes**

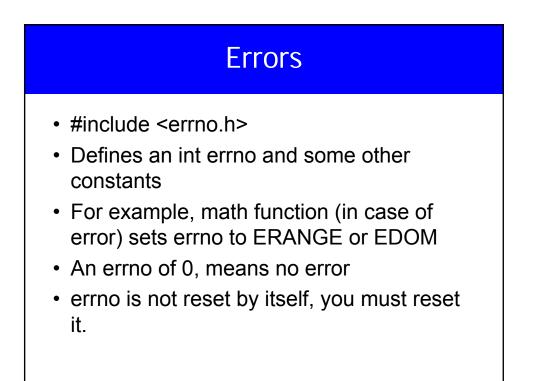
- Unaligned memory access (access to more than one byte must be aligned at a particular size), depends on the CPU.
- Using uninitialized pointers
- Going outside the array

#### Writing Good Code

- Debugging tools are no substitute to good programming practice.
- Be very careful with pointers and memory allocation and de-allocation
- Good modular design.
- Clear logic, boundary condition testing, assertions, limited global data, ...
- · Assigning responsibility

# Core files

- When a program dumps core, it creates a dump files called "core" in the current directory.
- The file is an image of memory, registers including stack and data at time of crash.
- Can use gdb program core
- Some extra tools for memory **dmalloc**, electric fence, bcheck, valgrind



#### Example

#include <stdio.h>
#include <errno.h>
#include <math.h>
#define POSITIVE 25
#define NEGATIVE -25

int main()

{ double ret;

errno = 0; ret = sqrt(NEGATIVE); if (errno == EDOM) /\*EDOM Signifies Domain Error\*/ printf("Domain Error : Invalid Input To Function\n"); else printf("Valid Input To Function\n");

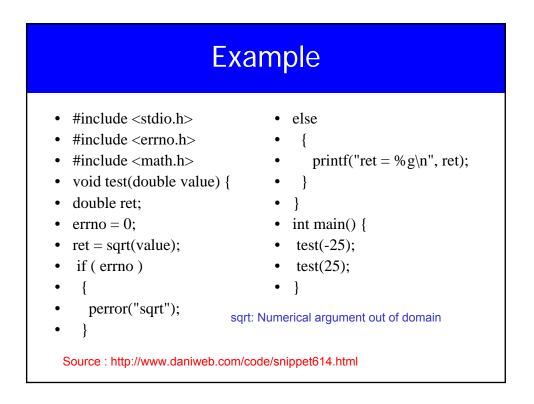
errno = 0; ret = sqrt(POSITIVE);

if (errno == EDOM) printf("Domain Error : Invalid Input To Function\n"); else

printf("Valid Input To Function\n");

return 0;

Source : http://www.daniweb.com/code/snippet614.html



# 1/0

- size\_t fread(void \*restrict ptr, size\_t size, size\_t ntimes, FILE \*restrict stream)
- size\_t fwrite(const void \*restrict ptr, size\_t size, size\_t nitems, FILE \*restrict stream);

## 1/0

- int fseek(FILE \*stream, long offset, int whence);
- The fseek() function shall set the file-position indicator for the stream pointed to by stream. If a read or write error occurs, the error indicator for the stream shall be set and fseek() fails.
- The new position, measured in bytes from the beginning of the file, shall be obtained by adding offset to the position specified by whence. The specified point is the beginning of the file for SEEK\_SET, the current value of the file-position indicator for SEEK\_CUR, or end-of-file for SEEK\_END.

### **Random Numbers**

- #include <stdlib.h>
- Int rand(void)
- Returns a random number between 0 and RAND\_MAX
- Each time the program runs the function returns the same sequence
- Important in debugging, but sometimes we want to return random numbers every time we run the program
- drand48() uses a much more elaborate random number generator

#### **Random Numbers**

- void srand(unsigned int seed))
- · Seds the random number generator
- For a truly random number that will not be repeated every time you run the program open and read from /dev/random or /dev/urandom

# Time

- In time.h
- time\_t time(time\_t \*x))
- Returns the number of seconds from jan. 1 1970
- If x is not NULL, the value is stored in the variable pointed to by x
- · Could be used to seed the RNG
- srand((unsigned int) time(NULL));