C PROGRAMMING FOR ENGINEERS

Basic Math & Character Functions

Basic Math Functions

- `fabs(x)` Computes the absolute value of **x**.
- `sqrt(x)` Computes the square root of **x**, where **x>=**0.
- `pow(x,y)` Used for exponentiation. Errors occur if **x**=0 and **y**<=0, or if **x**<0 and **y** is not an integer.
- `ceil(x)` Rounds **x** to the nearest integer toward ∞ (infinity). Example, `ceil(2.01)` is equal to 3.
- `floor(x)` Rounds **x** to the nearest integer toward -∞ (negative infinity). Example, `floor(2.01)` is equal to 2.
- `exp(x)` Computes the value of e^x.
- `log(x)` Returns ln x, the natural logarithm of **x** to the base *e*. Errors occur if x<=0.
- `log10(x)` Returns logarithm of x to the base 10. Errors occur if x<=0.

NOTE: Most mathematical functions assume that the arguments are double values. If a different type argument is used, it is converted to a double before the function is executed.

Trigonometric Functions

- `sin(x)` Computes the sine of `x`, where `x` is in radians.
- `cos(x)` Computes the cosine of `x`, where `x` is in radians
- **tan(x)** Computes the tangent of x, where x is in radians.
- **asin(x)** Computes the arcsine or inverse sine of x, where x must be in the range [-1, 1]. Returns an angle in radians in the range [-π/2,π/2].
- **acos(x)** Computes the arccosine or inverse cosine of x, where x must be in the range [-1, 1]. Returns an angle in radians in the range [0, π].
- **atan(x)** Computes the arctangent or inverse tangent of x. Returns an angle in radians in the range [-π/2,π/2].
- **atan2(y,x)** Computes the arctangent or inverse tangent of the value y/x. Returns an angle in radians in the range [-π, π].

NOTE: The trigonometric functions assume that all arguments are of double type and they return values of double type.

Character Functions

Character functions fall into two categories:

- Functions used to convert characters between upper and lower case.
- Functions used to preform character comparisons.

The preprocessor directive for character manipulation is:

```
#include <ctype.h>
```

Basic Character Functions Continued

- **toupper(ch)** If **ch** is a lowercase letter, this function returns the corresponding uppercase letter; otherwise, it returns **ch**
- **isdigit(ch)** Returns a nonzero value if **ch** is a decimal digit; otherwise, it returns a zero.
- **islower(ch)** Returns a nonzero value if **ch** is a lowercase letter; otherwise, it returns a zero.
- **isupper(ch)** Returns a nonzero value if **ch** is an uppercase letter; otherwise, it returns a zero.
- **isalpha(ch)** **R**eturns a nonzero value if **ch** is an uppercase letter or a lowercase letter; otherwise, it returns a zero.
- **isalnum(ch)** Returns a nonzero value if **ch** is an alphabetic character or a numeric digit; otherwise, it returns a zero.
- **getchar( )** Reads the next character from the keyboard and returns the integer value of the character.
- **putchar( )** Prints a character to the computer screen.