

These handouts are in no way a substitute of recommended textbooks and lectures delivered in the computer laboratory of BSRS department.

Mathematical Functions in C++

Required header is `#include<cmath>` or `#include <complex>`

Trigonometric functions

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO.
FIRST SEMESTER THIRD YEAR (5TH SEMESTER) B.E. (MECHANICAL) OF 13-BATCH

Subject: Numerical Analysis and Computer Applications
(PRACTICAL)

Lab: 02

Conducted on: 13/01/2015

Timings: 10am to 1pm

cos	Compute cosine (function)
sin	Compute sine (function)
tan	Compute tangent (function)
acos	Compute arc cosine (function)
asin	Compute arc sine (function)
atan	Compute arc tangent (function)

Hyperbolic functions

cosh	Compute hyperbolic cosine (function)
sinh	Compute hyperbolic sine (function)
tanh	Compute hyperbolic tangent (function)
acosh	Compute arc hyperbolic cosine (function)
asinh	Compute arc hyperbolic sine (function)
atanh	Compute arc hyperbolic tangent (function)

Exponential and logarithmic functions

exp	Compute exponential function (function)
log	Compute natural logarithm (function)
log10	Compute common logarithm (function)
log2	Compute binary logarithm (function)

Power functions

pow	Raise to power (function)
sqrt	Compute square root (function)
cbt	Compute cubic root (function)
hypot	Compute hypotenuse (function)

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Error and gamma functions

erf	Compute error function (function)
erfc	Compute complementary error function (function)
tgamma	Compute gamma function (function)
lgamma	Compute log-gamma function (function)

Rounding and remainder functions

ceil	Round up value (function)
floor	Round down value (function)
fmod	Compute remainder of division (function)
trunc	Truncate value (function)
round	Round to nearest (function)
lround	Round to nearest and cast to long integer (function)
llround	Round to nearest and cast to long long integer (function)
rint	Round to integral value (function)
lrint	Round and cast to long integer (function)
llrint	Round and cast to long long integer (function)
nearbyint	Round to nearby integral value (function)
remainder	Compute remainder (IEC 60559) (function)
remquo	Compute remainder and quotient (function)

Minimum, maximum, difference functions

fdim	Positive difference (function)
fmax	Maximum value (function)
fmin	Minimum value (function)

Other functions

fabs	Compute absolute value (function)
abs	Compute absolute value (function)

Note: *Given above is not a complete list of mathematical functions offered by C++. I have included only those which are, however, required to design source codes of the topics taught in the subject of Numerical Analysis and Computer applications. Detailed explanation and use of the above functions has been discussed with you in the computer laboratory of BSRS department by me while using the IDE of Dev C++. You must google to find rest of the functions.*

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Source Code 01

```
// This program computes absolute, relative and percentile errors
// Exact Value = 74.892456 and Approximate Value (up to 3dp)= 74.892
#include<iostream>
#include<cmath>
using namespace std;
int main ()
{
    float exact_value, approximate_value, absolute_error, relative_error, percentile_error;
    cout<<"Enter Exact and Approximate Value = ";
    cin>>exact_value>>approximate_value;
    absolute_error=abs(exact_value-approximate_value);
    relative_error=absolute_error/abs(exact_value);
    percentile_error=relative_error*100;
    cout<<"\n Absolute Error is    = "<<absolute_error<<endl;
    cout<<"\n Relative Error is    = "<<relative_error<<endl;
    cout<<"\n Percentile Error is  = "<<percentile_error<<endl;
    system("pause");
    return 0;
}
```

Output:

Enter Exact and Approximate Value = 74.892456 74.892

Absolute Error is = 0.000457764

Relative Error is = 6.11228e-006

Percentile Error is = 0.000611228

Press any key to continue . . .