1. **ПРОГРАММА И МЕТОДИКА ИСПЫТАНИЙ**
   1. **Объект испытаний**

Наименование темы разработки – «Нелинейные уравнения».

Наименование испытуемой программы – «Нелинейные уравнения.exe».

Программой будут пользоваться те люди, которым необходимо быстро решить систему нелинейных уравнений модифицированным методом Ньютона.

* 1. **Цель испытаний**

Проверка соответствия основных характеристик программы функциональным и иным видам требований, изложенным в программном документе «Техническое задание», является целью испытаний.

* 1. **Требования к программе**

Требования к программе описаны в п. «Требования к функциональным характеристикам» Технического задания.

* 1. **Требования к программной документации**

Состав программной документации должен включать в себя:

1) техническое задание;

2) описание программы;

3) программу и методики испытаний;

4) пояснительную записку;

5) ведомость эксплуатационных документов;

6) описание применения;

7) руководство программиста;

8) руководство оператора.

* 1. **Средства и порядок испытаний**

ПК с ОЗУ более 32 Мбайт, 8 МБ видеопамяти и выше, наличием более 30 Мбайт свободного места на жестком диске.

Проверки, проводимые во время испытаний:

а) проверка комплектности программной документации;

б) проверка комплектности и состава технических и программных средств;

в) проверка соответствия технических характеристик программы;

г) проверка степени выполнения требований функционального назначения программы.

* 1. **Методы испытаний**

Проверка комплектности программной документации на программное изделие производится визуально представителем службы, ответственной за эксплуатацию. В ходе проверки сопоставляется состав и комплектность программной документации, представленной Разработчиком, с перечнем программной документации, приведенным в п. «Состав программной документации, предъявляемой на испытания» настоящего документа. Проверка считается завершенной в случае соответствия состава и комплектности программной документации, представленной Разработчиком, перечню программной документации, приведенному в указанном выше пункте. По результатам проведения проверки, представитель службы, ответственной за эксплуатацию вносит запись в Протокол испытаний – “Комплектность программной документации соответствует (не соответствует) требованиям п. «Состав программной документации, предъявляемой на испытания»” настоящего документа.

Проверка комплектности и состава технических и программных средств производится визуально представителем службы, ответственной за эксплуатацию. В ходе проверки сопоставляется состав и комплектность технических и программных средств, представленных Разработчиком, с перечнем технических и программных средств, приведенным в п. «Технические средства, используемые во время испытаний» и п. «Программные средства, используемые во время испытаний» настоящего документа. Комплектность программных средств проводится также визуально. Загрузилась операционная система, высветился логотип, версия - соответствует/не соответствует заявленной в Техническом задании и т.д. Проверка считается завершенной в случае соответствия состава и комплектности технических и программных средств, представленных Разработчиком, с перечнем технических и программных средств, приведенных в пп. «Технические средства, используемые во время испытаний» и «Программные средства, используемые во время испытаний» настоящего документа. По результатам проведения проверки представитель службы, ответственной за эксплуатацию, вносит запись в Протокол испытаний - «Комплектность технических и программных средств соответствует (не соответствует) требованиям пп. «Технические средства, используемые во время испытаний» и «Программные средства, используемые во время испытаний» настоящего документа».

Проверка работоспособности программы выполняется согласно п. «Проверка работоспособности программы» Руководства системного программиста. Проверка считается завершенной в случае соответствия состава и последовательности действий, при выполнении данной проверки, указанному выше подразделу Руководства системного программиста. По результатам проведения проверки представитель службы, ответственной за эксплуатацию вносит запись в Протокол испытаний - «п. “Проверка работоспособности программы“ выполнена».

* 1. **Проверка работоспособности программы**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Назначение проверки | Номер теста | Значения входных переменных | Ожидаемый результат работы программы | Результат тестирования |
| Проверка работоспособности в рабочем диапазоне данных | 1 | 3,4 | Программа работает корректно.  Расчет происходит. | Рисунок 1 Работа программы с числами внутри рабочего диапазона |
| 2 | чтение | Программа работает корректно.  Чтение из файла происходит. | Рисунок 2 Чтение из файла |
| 3 | Очистка,  чтение | Программа работает корректно.  Чтение из не файла происходит. | Рисунок 3Очистка файла и последующее чтение |
| Проверка реакции программы на ввод данных вне рабочего диапазона | 4 | 2.14748e+09, 7 | Программа работает не корректно.  Результат вычислений неверен. | Рисунок 4 Работа программы с числами вне рабочего диапазона |
| Проверка реакции на ошибку типа входных данных | 5 | hhhh | Программа работает корректно.  Присвоение переменной значения не происходит. | Рисунок 5 Работа программы с неверными типами данных |

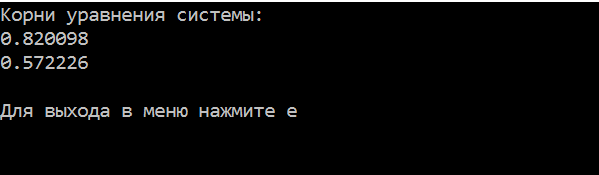


Рисунок 1 Работа программы с числами внутри рабочего диапазона

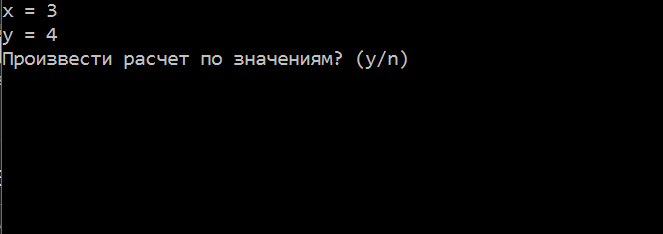


Рисунок 2 Чтение из файла

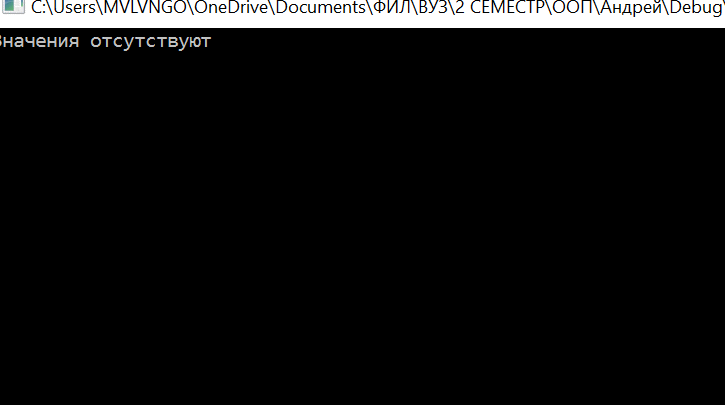


Рисунок 3 Очистка файла и последующее чтение

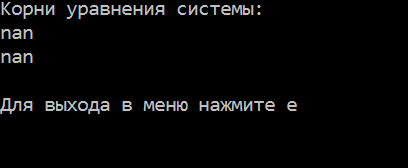


Рисунок 4 Работа программы с числами вне рабочего диапазона

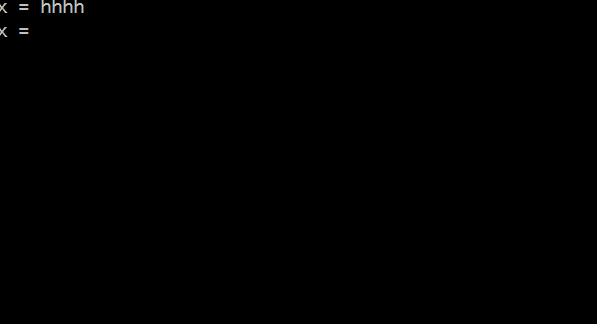


Рисунок 5 Работа программы с неверными типами данных

Данная программа вычисляет следующую систему с точностью 0,0001 (определено макросом #define):

sin(x+y) - 1.2x = 0  
x\*x + y\*y =1

Пользователю необходимо ввести значения x и y.

Функции:

* function1() и function2() – это вычисление каждого отдельного уравнения нашей системы
* func11() – является частной производной первого порядка для первого уравнения по Х
* func12() – является частной производной первого порядка для первого уравнения по Y
* func21() – является частной производной первого порядка для второго уравнения по X
* func22() – является частной производной первого порядка для второго уравнения по Y
* ober\_matr() – вычисляет обратную матрицу. В данном случае вычисляется она для Якобиана. Якобиан – это матрица, составленная из частных производных первого порядка.
* nuton() – функция вычисления корней системы уравнений методом Ньютона



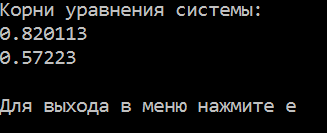


Рисунок 6 Дополнительные значения функционирования программы

Поскольку в ходе разработки программы использовались математические формулы для sin и cos, то для проверки правильности вычислений необходимо руководствоваться табличными значениями. (см. Приложение4).

## **Текст программы**

#include <iostream>

#include <Windows.h>

#include <conio.h>

#include <clocale>

#include <cmath>

#include <fstream>

#include <string>

#define epsilon 0.0001;

using namespace std;

int decision;

const string filename = "forNum.txt";

double function1(double x, double y);

double function2(double x, double y);

double func11(double x, double y);

double func12(double x, double y);

double func21(double x, double y);

double func22(double x, double y);

void ober\_matr(double a[2][2]);

void nuton(double x, double y);

void information();

void clearFile();

int prog();

int progg();

bool checkIsDigit(char \*str);

ofstream write;

ifstream read;

int main() {

setlocale(LC\_ALL, "Russian");

do

{

main:

system("cls");

cout << "Решение сиситемы нелинейных уравнений модифицированным методом Ньютона \n";

cout << "Если вы хотите начать расчет - нажмите s \n";

cout << "Если вы хотите считать данные из файла нажмите r \n";

cout << "Если вы хотите очистить файл нажмите с \n";

cout << "Если вы хотите получить справку нажмите i \n";

cout << "Если вы хотите выйти нажмите e \n";

decision = \_getch();

switch (decision)

{

case 105: {

information();

break;

}

case 115: {

prog();

break;

}

case 114:

{

progg();

break;

}

case 99: {

clearFile();

break;

}

case 101:

{

system("cls");

cout << "Программа завершена";

Sleep(1000);

return 0;

}

default:

{

system("cls");

cout << "Ошибка";

Sleep(1500);

system("cls");

}

}

} while (1);

}

int prog()

{

double x, y;

system("cls");

bool isBreak = false;

do {

cout << "x = ";

char num\_ch[100];

cin >> num\_ch;

for (int i = 0; num\_ch[i] != '\0'; i++)

{

if (num\_ch[i] < 48 || num\_ch[i]>57)

isBreak = true;

else {

isBreak = false;

x = atoi(num\_ch);

}

}

} while (isBreak == true);

do {

cout << "y = ";

char num\_ch[100];

cin >> num\_ch;

for (int i = 0; num\_ch[i] != '\0'; i++)

{

if (num\_ch[i] < 48 || num\_ch[i]>57)

isBreak = true;

else {

isBreak = false;

y = atoi(num\_ch);

}

}

} while (isBreak == true);

write.open(filename);

write << x << endl << y;

write.close();

nuton(x, y);

cout << endl;

do {

cout << "Для выхода в меню нажмите е";

decision = \_getch();

system("cls");

} while (decision != 101);

return 0;

}

int progg()

{

double x, y;

read.open(filename);

read >> x;

read >> y;

read.close();

if (x == NULL)

{

system("cls");

cout << "Значения отсутствуют \n";

Sleep(2000);

}

else {

system("cls");

cout <<"x = " << x << endl << "y = " << y;

do {

cout << "\n" << "Произвести расчет по значениям? (y/n)";

decision = \_getch();

} while (decision != 121 && decision != 110);

if (decision == 121)

{

nuton(x, y);

cout << endl;

do {

cout << "Для выхода в меню нажмите е";

decision = \_getch();

system("cls");

} while (decision != 101);

}

else

{

system("cls");

return 0;

}

}

}

double function1(double x, double y)

{

return sin(x + y) - 1.2\*x;

}

double function2(double x, double y)

{

return x\*x + y\*y - 1;

}

double func11(double x, double y)

{

return cos(x + y) - 1.2;

}

double func12(double x, double y)

{

return cos(x + y);

}

double func21(double x, double y)

{

return 2 \* x;

}

double func22(double x, double y)

{

return 2 \* y;

}

void ober\_matr(double a[2][2])

{

double det, aa;

det = a[0][0] \* a[1][1] - a[0][1] \* a[1][0];

aa = a[0][0];

a[0][0] = a[1][1] / det;

a[1][1] = aa / det;

aa = a[0][1];

a[0][1] = -a[0][1] / det;

a[1][0] = -a[1][0] / det;

}

void nuton(double x, double y)

{

int i = 1;

double a[2][2], dx, dy, b[2], norm;

do

{

a[0][0] = func11(x, y);

a[0][1] = func12(x, y);

a[1][0] = func21(x, y);

a[1][1] = func22(x, y);

ober\_matr(a);

dx = -a[0][0] \* function1(x, y) + -a[0][1] \* function2(x, y);

dy = -a[1][0] \* function1(x, y) + -a[1][1] \* function2(x, y);

x = x + dx;

y = y + dy;

b[0] = function1(x, y);

b[1] = function2(x, y);

norm = sqrt(b[0] \* b[0] + b[1] \* b[1]);

i++;

} while (norm >= 0.0001);

system("cls");

cout << "решение системы:" << endl<< x << endl << y << endl;

}

void information()

{

system("cls");

cout << "Метод Ньютона яаляется наиболе распространенным методом решения сиситем уравнений. Он задается следующим алгоритмом: \n" << "1. Задаем относительную погрешность е, число уравнений n, максимальное число итераций m и вектор начальных приближений xi. \n" << "2. Используя разложение в ряд Тэйлора формируется матрица Якоби, необходимая для рачета приращений при малом изменений переменных. \n" << "Поскольку аналитическое дифференцирование в общем случае нежелательно, в матрице Якоби частные производные заменяются приближенными кончено - разностными значениями. \n";

do {

cout << "Для выхода в меню нажмите e \n";

decision = \_getch();

} while (decision != 101);

}

void clearFile()

{

double x, y;

x = NULL;

y = NULL;

write.open(filename);

write << x << endl << y;

write.close();

system("cls");

cout << "Файл очищен";

Sleep(1500);

system("cls");

}

bool checkIsDigit(char \*str)

{

while (\*str != 0)

{

if (!isdigit(\*str++))

return false;

}

return true;

}

## **Приложение**

Таблица синусов 0° - 180°

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | Sin(1°) | 0.0175 | | Sin(2°) | 0.0349 | | Sin(3°) | 0.0523 | | Sin(4°) | 0.0698 | | Sin(5°) | 0.0872 | | Sin(6°) | 0.1045 | | Sin(7°) | 0.1219 | | Sin(8°) | 0.1392 | | Sin(9°) | 0.1564 | | Sin(10°) | 0.1736 | | Sin(11°) | 0.1908 | | Sin(12°) | 0.2079 | | Sin(13°) | 0.225 | | Sin(14°) | 0.2419 | | Sin(15°) | 0.2588 | | Sin(16°) | 0.2756 | | Sin(17°) | 0.2924 | | Sin(18°) | 0.309 | | Sin(19°) | 0.3256 | | Sin(20°) | 0.342 | | Sin(21°) | 0.3584 | | Sin(22°) | 0.3746 | | Sin(23°) | 0.3907 | | Sin(24°) | 0.4067 | | Sin(25°) | 0.4226 | | Sin(26°) | 0.4384 | | Sin(27°) | 0.454 | | Sin(28°) | 0.4695 | | Sin(29°) | 0.4848 | | Sin(30°) | 0.5 | | Sin(31°) | 0.515 | | Sin(32°) | 0.5299 | | Sin(33°) | 0.5446 | | Sin(34°) | 0.5592 | | Sin(35°) | 0.5736 | | Sin(36°) | 0.5878 | | Sin(37°) | 0.6018 | | Sin(38°) | 0.6157 | | Sin(39°) | 0.6293 | | Sin(40°) | 0.6428 | | Sin(41°) | 0.6561 | | Sin(42°) | 0.6691 | | Sin(43°) | 0.682 | | Sin(44°) | 0.6947 | | Sin(45°) | 0.7071 | | |  |  | | --- | --- | | Sin(46°) | 0.7193 | | Sin(47°) | 0.7314 | | Sin(48°) | 0.7431 | | Sin(49°) | 0.7547 | | Sin(50°) | 0.766 | | Sin(51°) | 0.7771 | | Sin(52°) | 0.788 | | Sin(53°) | 0.7986 | | Sin(54°) | 0.809 | | Sin(55°) | 0.8192 | | Sin(56°) | 0.829 | | Sin(57°) | 0.8387 | | Sin(58°) | 0.848 | | Sin(59°) | 0.8572 | | Sin(60°) | 0.866 | | Sin(61°) | 0.8746 | | Sin(62°) | 0.8829 | | Sin(63°) | 0.891 | | Sin(64°) | 0.8988 | | Sin(65°) | 0.9063 | | Sin(66°) | 0.9135 | | Sin(67°) | 0.9205 | | Sin(68°) | 0.9272 | | Sin(69°) | 0.9336 | | Sin(70°) | 0.9397 | | Sin(71°) | 0.9455 | | Sin(72°) | 0.9511 | | Sin(73°) | 0.9563 | | Sin(74°) | 0.9613 | | Sin(75°) | 0.9659 | | Sin(76°) | 0.9703 | | Sin(77°) | 0.9744 | | Sin(78°) | 0.9781 | | Sin(79°) | 0.9816 | | Sin(80°) | 0.9848 | | Sin(81°) | 0.9877 | | Sin(82°) | 0.9903 | | Sin(83°) | 0.9925 | | Sin(84°) | 0.9945 | | Sin(85°) | 0.9962 | | Sin(86°) | 0.9976 | | Sin(87°) | 0.9986 | | Sin(88°) | 0.9994 | | Sin(89°) | 0.9998 | | Sin(90°) | 1 | | |  |  | | --- | --- | | Sin(91°) | 0.9998 | | Sin(92°) | 0.9994 | | Sin(93°) | 0.9986 | | Sin(94°) | 0.9976 | | Sin(95°) | 0.9962 | | Sin(96°) | 0.9945 | | Sin(97°) | 0.9925 | | Sin(98°) | 0.9903 | | Sin(99°) | 0.9877 | | Sin(100°) | 0.9848 | | Sin(101°) | 0.9816 | | Sin(102°) | 0.9781 | | Sin(103°) | 0.9744 | | Sin(104°) | 0.9703 | | Sin(105°) | 0.9659 | | Sin(106°) | 0.9613 | | Sin(107°) | 0.9563 | | Sin(108°) | 0.9511 | | Sin(109°) | 0.9455 | | Sin(110°) | 0.9397 | | Sin(111°) | 0.9336 | | Sin(112°) | 0.9272 | | Sin(113°) | 0.9205 | | Sin(114°) | 0.9135 | | Sin(115°) | 0.9063 | | Sin(116°) | 0.8988 | | Sin(117°) | 0.891 | | Sin(118°) | 0.8829 | | Sin(119°) | 0.8746 | | Sin(120°) | 0.866 | | Sin(121°) | 0.8572 | | Sin(122°) | 0.848 | | Sin(123°) | 0.8387 | | Sin(124°) | 0.829 | | Sin(125°) | 0.8192 | | Sin(126°) | 0.809 | | Sin(127°) | 0.7986 | | Sin(128°) | 0.788 | | Sin(129°) | 0.7771 | | Sin(130°) | 0.766 | | Sin(131°) | 0.7547 | | Sin(132°) | 0.7431 | | Sin(133°) | 0.7314 | | Sin(134°) | 0.7193 | | Sin(135°) | 0.7071 | | |  |  | | --- | --- | | Sin(136°) | 0.6947 | | Sin(137°) | 0.682 | | Sin(138°) | 0.6691 | | Sin(139°) | 0.6561 | | Sin(140°) | 0.6428 | | Sin(141°) | 0.6293 | | Sin(142°) | 0.6157 | | Sin(143°) | 0.6018 | | Sin(144°) | 0.5878 | | Sin(145°) | 0.5736 | | Sin(146°) | 0.5592 | | Sin(147°) | 0.5446 | | Sin(148°) | 0.5299 | | Sin(149°) | 0.515 | | Sin(150°) | 0.5 | | Sin(151°) | 0.4848 | | Sin(152°) | 0.4695 | | Sin(153°) | 0.454 | | Sin(154°) | 0.4384 | | Sin(155°) | 0.4226 | | Sin(156°) | 0.4067 | | Sin(157°) | 0.3907 | | Sin(158°) | 0.3746 | | Sin(159°) | 0.3584 | | Sin(160°) | 0.342 | | Sin(161°) | 0.3256 | | Sin(162°) | 0.309 | | Sin(163°) | 0.2924 | | Sin(164°) | 0.2756 | | Sin(165°) | 0.2588 | | Sin(166°) | 0.2419 | | Sin(167°) | 0.225 | | Sin(168°) | 0.2079 | | Sin(169°) | 0.1908 | | Sin(170°) | 0.1736 | | Sin(171°) | 0.1564 | | Sin(172°) | 0.1392 | | Sin(173°) | 0.1219 | | Sin(174°) | 0.1045 | | Sin(175°) | 0.0872 | | Sin(176°) | 0.0698 | | Sin(177°) | 0.0523 | | Sin(178°) | 0.0349 | | Sin(179°) | 0.0175 | | Sin(180°) | 0 | |

Таблица синусов 180° - 360°

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | Sin(181°) | -0.0175 | | Sin(182°) | -0.0349 | | Sin(183°) | -0.0523 | | Sin(184°) | -0.0698 | | Sin(185°) | -0.0872 | | Sin(186°) | -0.1045 | | Sin(187°) | -0.1219 | | Sin(188°) | -0.1392 | | Sin(189°) | -0.1564 | | Sin(190°) | -0.1736 | | Sin(191°) | -0.1908 | | Sin(192°) | -0.2079 | | Sin(193°) | -0.225 | | Sin(194°) | -0.2419 | | Sin(195°) | -0.2588 | | Sin(196°) | -0.2756 | | Sin(197°) | -0.2924 | | Sin(198°) | -0.309 | | Sin(199°) | -0.3256 | | Sin(200°) | -0.342 | | Sin(201°) | -0.3584 | | Sin(202°) | -0.3746 | | Sin(203°) | -0.3907 | | Sin(204°) | -0.4067 | | Sin(205°) | -0.4226 | | Sin(206°) | -0.4384 | | Sin(207°) | -0.454 | | Sin(208°) | -0.4695 | | Sin(209°) | -0.4848 | | Sin(210°) | -0.5 | | Sin(211°) | -0.515 | | Sin(212°) | -0.5299 | | Sin(213°) | -0.5446 | | Sin(214°) | -0.5592 | | Sin(215°) | -0.5736 | | Sin(216°) | -0.5878 | | Sin(217°) | -0.6018 | | Sin(218°) | -0.6157 | | Sin(219°) | -0.6293 | | Sin(220°) | -0.6428 | | Sin(221°) | -0.6561 | | Sin(222°) | -0.6691 | | Sin(223°) | -0.682 | | Sin(224°) | -0.6947 | | Sin(225°) | -0.7071 | | |  |  | | --- | --- | | Sin(226°) | -0.7193 | | Sin(227°) | -0.7314 | | Sin(228°) | -0.7431 | | Sin(229°) | -0.7547 | | Sin(230°) | -0.766 | | Sin(231°) | -0.7771 | | Sin(232°) | -0.788 | | Sin(233°) | -0.7986 | | Sin(234°) | -0.809 | | Sin(235°) | -0.8192 | | Sin(236°) | -0.829 | | Sin(237°) | -0.8387 | | Sin(238°) | -0.848 | | Sin(239°) | -0.8572 | | Sin(240°) | -0.866 | | Sin(241°) | -0.8746 | | Sin(242°) | -0.8829 | | Sin(243°) | -0.891 | | Sin(244°) | -0.8988 | | Sin(245°) | -0.9063 | | Sin(246°) | -0.9135 | | Sin(247°) | -0.9205 | | Sin(248°) | -0.9272 | | Sin(249°) | -0.9336 | | Sin(250°) | -0.9397 | | Sin(251°) | -0.9455 | | Sin(252°) | -0.9511 | | Sin(253°) | -0.9563 | | Sin(254°) | -0.9613 | | Sin(255°) | -0.9659 | | Sin(256°) | -0.9703 | | Sin(257°) | -0.9744 | | Sin(258°) | -0.9781 | | Sin(259°) | -0.9816 | | Sin(260°) | -0.9848 | | Sin(261°) | -0.9877 | | Sin(262°) | -0.9903 | | Sin(263°) | -0.9925 | | Sin(264°) | -0.9945 | | Sin(265°) | -0.9962 | | Sin(266°) | -0.9976 | | Sin(267°) | -0.9986 | | Sin(268°) | -0.9994 | | Sin(269°) | -0.9998 | | Sin(270°) | -1 | | |  |  | | --- | --- | | Sin(271°) | -0.9998 | | Sin(272°) | -0.9994 | | Sin(273°) | -0.9986 | | Sin(274°) | -0.9976 | | Sin(275°) | -0.9962 | | Sin(276°) | -0.9945 | | Sin(277°) | -0.9925 | | Sin(278°) | -0.9903 | | Sin(279°) | -0.9877 | | Sin(280°) | -0.9848 | | Sin(281°) | -0.9816 | | Sin(282°) | -0.9781 | | Sin(283°) | -0.9744 | | Sin(284°) | -0.9703 | | Sin(285°) | -0.9659 | | Sin(286°) | -0.9613 | | Sin(287°) | -0.9563 | | Sin(288°) | -0.9511 | | Sin(289°) | -0.9455 | | Sin(290°) | -0.9397 | | Sin(291°) | -0.9336 | | Sin(292°) | -0.9272 | | Sin(293°) | -0.9205 | | Sin(294°) | -0.9135 | | Sin(295°) | -0.9063 | | Sin(296°) | -0.8988 | | Sin(297°) | -0.891 | | Sin(298°) | -0.8829 | | Sin(299°) | -0.8746 | | Sin(300°) | -0.866 | | Sin(301°) | -0.8572 | | Sin(302°) | -0.848 | | Sin(303°) | -0.8387 | | Sin(304°) | -0.829 | | Sin(305°) | -0.8192 | | Sin(306°) | -0.809 | | Sin(307°) | -0.7986 | | Sin(308°) | -0.788 | | Sin(309°) | -0.7771 | | Sin(310°) | -0.766 | | Sin(311°) | -0.7547 | | Sin(312°) | -0.7431 | | Sin(313°) | -0.7314 | | Sin(314°) | -0.7193 | | Sin(315°) | -0.7071 | | |  |  | | --- | --- | | Sin(316°) | -0.6947 | | Sin(317°) | -0.682 | | Sin(318°) | -0.6691 | | Sin(319°) | -0.6561 | | Sin(320°) | -0.6428 | | Sin(321°) | -0.6293 | | Sin(322°) | -0.6157 | | Sin(323°) | -0.6018 | | Sin(324°) | -0.5878 | | Sin(325°) | -0.5736 | | Sin(326°) | -0.5592 | | Sin(327°) | -0.5446 | | Sin(328°) | -0.5299 | | Sin(329°) | -0.515 | | Sin(330°) | -0.5 | | Sin(331°) | -0.4848 | | Sin(332°) | -0.4695 | | Sin(333°) | -0.454 | | Sin(334°) | -0.4384 | | Sin(335°) | -0.4226 | | Sin(336°) | -0.4067 | | Sin(337°) | -0.3907 | | Sin(338°) | -0.3746 | | Sin(339°) | -0.3584 | | Sin(340°) | -0.342 | | Sin(341°) | -0.3256 | | Sin(342°) | -0.309 | | Sin(343°) | -0.2924 | | Sin(344°) | -0.2756 | | Sin(345°) | -0.2588 | | Sin(346°) | -0.2419 | | Sin(347°) | -0.225 | | Sin(348°) | -0.2079 | | Sin(349°) | -0.1908 | | Sin(350°) | -0.1736 | | Sin(351°) | -0.1564 | | Sin(352°) | -0.1392 | | Sin(353°) | -0.1219 | | Sin(354°) | -0.1045 | | Sin(355°) | -0.0872 | | Sin(356°) | -0.0698 | | Sin(357°) | -0.0523 | | Sin(358°) | -0.0349 | | Sin(359°) | -0.0175 | | Sin(360°) | -0 | |

Таблица косинусов 0° - 180°

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | Cos(1°) | 0.9998 | | Cos(2°) | 0.9994 | | Cos(3°) | 0.9986 | | Cos(4°) | 0.9976 | | Cos(5°) | 0.9962 | | Cos(6°) | 0.9945 | | Cos(7°) | 0.9925 | | Cos(8°) | 0.9903 | | Cos(9°) | 0.9877 | | Cos(10°) | 0.9848 | | Cos(11°) | 0.9816 | | Cos(12°) | 0.9781 | | Cos(13°) | 0.9744 | | Cos(14°) | 0.9703 | | Cos(15°) | 0.9659 | | Cos(16°) | 0.9613 | | Cos(17°) | 0.9563 | | Cos(18°) | 0.9511 | | Cos(19°) | 0.9455 | | Cos(20°) | 0.9397 | | Cos(21°) | 0.9336 | | Cos(22°) | 0.9272 | | Cos(23°) | 0.9205 | | Cos(24°) | 0.9135 | | Cos(25°) | 0.9063 | | Cos(26°) | 0.8988 | | Cos(27°) | 0.891 | | Cos(28°) | 0.8829 | | Cos(29°) | 0.8746 | | Cos(30°) | 0.866 | | Cos(31°) | 0.8572 | | Cos(32°) | 0.848 | | Cos(33°) | 0.8387 | | Cos(34°) | 0.829 | | Cos(35°) | 0.8192 | | Cos(36°) | 0.809 | | Cos(37°) | 0.7986 | | Cos(38°) | 0.788 | | Cos(39°) | 0.7771 | | Cos(40°) | 0.766 | | Cos(41°) | 0.7547 | | Cos(42°) | 0.7431 | | Cos(43°) | 0.7314 | | Cos(44°) | 0.7193 | | Cos(45°) | 0.7071 | | Cos(46°) | 0.6947 | | Cos(47°) | 0.682 | | Cos(48°) | 0.6691 | | Cos(49°) | 0.6561 | | Cos(50°) | 0.6428 | | Cos(51°) | 0.6293 | | Cos(52°) | 0.6157 | | Cos(53°) | 0.6018 | | Cos(54°) | 0.5878 | | Cos(55°) | 0.5736 | | Cos(56°) | 0.5592 | | Cos(57°) | 0.5446 | | Cos(58°) | 0.5299 | | Cos(59°) | 0.515 | | Cos(60°) | 0.5 | | |  |  | | --- | --- | | Cos(61°) | 0.4848 | | Cos(62°) | 0.4695 | | Cos(63°) | 0.454 | | Cos(64°) | 0.4384 | | Cos(65°) | 0.4226 | | Cos(66°) | 0.4067 | | Cos(67°) | 0.3907 | | Cos(68°) | 0.3746 | | Cos(69°) | 0.3584 | | Cos(70°) | 0.342 | | Cos(71°) | 0.3256 | | Cos(72°) | 0.309 | | Cos(73°) | 0.2924 | | Cos(74°) | 0.2756 | | Cos(75°) | 0.2588 | | Cos(76°) | 0.2419 | | Cos(77°) | 0.225 | | Cos(78°) | 0.2079 | | Cos(79°) | 0.1908 | | Cos(80°) | 0.1736 | | Cos(81°) | 0.1564 | | Cos(82°) | 0.1392 | | Cos(83°) | 0.1219 | | Cos(84°) | 0.1045 | | Cos(85°) | 0.0872 | | Cos(86°) | 0.0698 | | Cos(87°) | 0.0523 | | Cos(88°) | 0.0349 | | Cos(89°) | 0.0175 | | Cos(90°) | 0 | | Cos(91°) | -0.0175 | | Cos(92°) | -0.0349 | | Cos(93°) | -0.0523 | | Cos(94°) | -0.0698 | | Cos(95°) | -0.0872 | | Cos(96°) | -0.1045 | | Cos(97°) | -0.1219 | | Cos(98°) | -0.1392 | | Cos(99°) | -0.1564 | | Cos(100°) | -0.1736 | | Cos(101°) | -0.1908 | | Cos(102°) | -0.2079 | | Cos(103°) | -0.225 | | Cos(104°) | -0.2419 | | Cos(105°) | -0.2588 | | Cos(106°) | -0.2756 | | Cos(107°) | -0.2924 | | Cos(108°) | -0.309 | | Cos(109°) | -0.3256 | | Cos(110°) | -0.342 | | Cos(111°) | -0.3584 | | Cos(112°) | -0.3746 | | Cos(113°) | -0.3907 | | Cos(114°) | -0.4067 | | Cos(115°) | -0.4226 | | Cos(116°) | -0.4384 | | Cos(117°) | -0.454 | | Cos(118°) | -0.4695 | | Cos(119°) | -0.4848 | | Cos(120°) | -0.5 | | |  |  | | --- | --- | | Cos(121°) | -0.515 | | Cos(122°) | -0.5299 | | Cos(123°) | -0.5446 | | Cos(124°) | -0.5592 | | Cos(125°) | -0.5736 | | Cos(126°) | -0.5878 | | Cos(127°) | -0.6018 | | Cos(128°) | -0.6157 | | Cos(129°) | -0.6293 | | Cos(130°) | -0.6428 | | Cos(131°) | -0.6561 | | Cos(132°) | -0.6691 | | Cos(133°) | -0.682 | | Cos(134°) | -0.6947 | | Cos(135°) | -0.7071 | | Cos(136°) | -0.7193 | | Cos(137°) | -0.7314 | | Cos(138°) | -0.7431 | | Cos(139°) | -0.7547 | | Cos(140°) | -0.766 | | Cos(141°) | -0.7771 | | Cos(142°) | -0.788 | | Cos(143°) | -0.7986 | | Cos(144°) | -0.809 | | Cos(145°) | -0.8192 | | Cos(146°) | -0.829 | | Cos(147°) | -0.8387 | | Cos(148°) | -0.848 | | Cos(149°) | -0.8572 | | Cos(150°) | -0.866 | | Cos(151°) | -0.8746 | | Cos(152°) | -0.8829 | | Cos(153°) | -0.891 | | Cos(154°) | -0.8988 | | Cos(155°) | -0.9063 | | Cos(156°) | -0.9135 | | Cos(157°) | -0.9205 | | Cos(158°) | -0.9272 | | Cos(159°) | -0.9336 | | Cos(160°) | -0.9397 | | Cos(161°) | -0.9455 | | Cos(162°) | -0.9511 | | Cos(163°) | -0.9563 | | Cos(164°) | -0.9613 | | Cos(165°) | -0.9659 | | Cos(166°) | -0.9703 | | Cos(167°) | -0.9744 | | Cos(168°) | -0.9781 | | Cos(169°) | -0.9816 | | Cos(170°) | -0.9848 | | Cos(171°) | -0.9877 | | Cos(172°) | -0.9903 | | Cos(173°) | -0.9925 | | Cos(174°) | -0.9945 | | Cos(175°) | -0.9962 | | Cos(176°) | -0.9976 | | Cos(177°) | -0.9986 | | Cos(178°) | -0.9994 | | Cos(179°) | -0.9998 | | Cos(180°) | -1 | |

Таблица косинусов 180° - 360°

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| |  |  | | --- | --- | | Cos(181°) | -0.9998 | | Cos(182°) | -0.9994 | | Cos(183°) | -0.9986 | | Cos(184°) | -0.9976 | | Cos(185°) | -0.9962 | | Cos(186°) | -0.9945 | | Cos(187°) | -0.9925 | | Cos(188°) | -0.9903 | | Cos(189°) | -0.9877 | | Cos(190°) | -0.9848 | | Cos(191°) | -0.9816 | | Cos(192°) | -0.9781 | | Cos(193°) | -0.9744 | | Cos(194°) | -0.9703 | | Cos(195°) | -0.9659 | | Cos(196°) | -0.9613 | | Cos(197°) | -0.9563 | | Cos(198°) | -0.9511 | | Cos(199°) | -0.9455 | | Cos(200°) | -0.9397 | | Cos(201°) | -0.9336 | | Cos(202°) | -0.9272 | | Cos(203°) | -0.9205 | | Cos(204°) | -0.9135 | | Cos(205°) | -0.9063 | | Cos(206°) | -0.8988 | | Cos(207°) | -0.891 | | Cos(208°) | -0.8829 | | Cos(209°) | -0.8746 | | Cos(210°) | -0.866 | | Cos(211°) | -0.8572 | | Cos(212°) | -0.848 | | Cos(213°) | -0.8387 | | Cos(214°) | -0.829 | | Cos(215°) | -0.8192 | | Cos(216°) | -0.809 | | Cos(217°) | -0.7986 | | Cos(218°) | -0.788 | | Cos(219°) | -0.7771 | | Cos(220°) | -0.766 | | Cos(221°) | -0.7547 | | Cos(222°) | -0.7431 | | Cos(223°) | -0.7314 | | Cos(224°) | -0.7193 | | Cos(225°) | -0.7071 | | Cos(226°) | -0.6947 | | Cos(227°) | -0.682 | | Cos(228°) | -0.6691 | | Cos(229°) | -0.6561 | | Cos(230°) | -0.6428 | | Cos(231°) | -0.6293 | | Cos(232°) | -0.6157 | | Cos(233°) | -0.6018 | | Cos(234°) | -0.5878 | | Cos(235°) | -0.5736 | | Cos(236°) | -0.5592 | | Cos(237°) | -0.5446 | | Cos(238°) | -0.5299 | | Cos(239°) | -0.515 | | Cos(240°) | -0.5 | | |  |  | | --- | --- | | Cos(241°) | -0.4848 | | Cos(242°) | -0.4695 | | Cos(243°) | -0.454 | | Cos(244°) | -0.4384 | | Cos(245°) | -0.4226 | | Cos(246°) | -0.4067 | | Cos(247°) | -0.3907 | | Cos(248°) | -0.3746 | | Cos(249°) | -0.3584 | | Cos(250°) | -0.342 | | Cos(251°) | -0.3256 | | Cos(252°) | -0.309 | | Cos(253°) | -0.2924 | | Cos(254°) | -0.2756 | | Cos(255°) | -0.2588 | | Cos(256°) | -0.2419 | | Cos(257°) | -0.225 | | Cos(258°) | -0.2079 | | Cos(259°) | -0.1908 | | Cos(260°) | -0.1736 | | Cos(261°) | -0.1564 | | Cos(262°) | -0.1392 | | Cos(263°) | -0.1219 | | Cos(264°) | -0.1045 | | Cos(265°) | -0.0872 | | Cos(266°) | -0.0698 | | Cos(267°) | -0.0523 | | Cos(268°) | -0.0349 | | Cos(269°) | -0.0175 | | Cos(270°) | -0 | | Cos(271°) | 0.0175 | | Cos(272°) | 0.0349 | | Cos(273°) | 0.0523 | | Cos(274°) | 0.0698 | | Cos(275°) | 0.0872 | | Cos(276°) | 0.1045 | | Cos(277°) | 0.1219 | | Cos(278°) | 0.1392 | | Cos(279°) | 0.1564 | | Cos(280°) | 0.1736 | | Cos(281°) | 0.1908 | | Cos(282°) | 0.2079 | | Cos(283°) | 0.225 | | Cos(284°) | 0.2419 | | Cos(285°) | 0.2588 | | Cos(286°) | 0.2756 | | Cos(287°) | 0.2924 | | Cos(288°) | 0.309 | | Cos(289°) | 0.3256 | | Cos(290°) | 0.342 | | Cos(291°) | 0.3584 | | Cos(292°) | 0.3746 | | Cos(293°) | 0.3907 | | Cos(294°) | 0.4067 | | Cos(295°) | 0.4226 | | Cos(296°) | 0.4384 | | Cos(297°) | 0.454 | | Cos(298°) | 0.4695 | | Cos(299°) | 0.4848 | | Cos(300°) | 0.5 | | |  |  | | --- | --- | | Cos(301°) | 0.515 | | Cos(302°) | 0.5299 | | Cos(303°) | 0.5446 | | Cos(304°) | 0.5592 | | Cos(305°) | 0.5736 | | Cos(306°) | 0.5878 | | Cos(307°) | 0.6018 | | Cos(308°) | 0.6157 | | Cos(309°) | 0.6293 | | Cos(310°) | 0.6428 | | Cos(311°) | 0.6561 | | Cos(312°) | 0.6691 | | Cos(313°) | 0.682 | | Cos(314°) | 0.6947 | | Cos(315°) | 0.7071 | | Cos(316°) | 0.7193 | | Cos(317°) | 0.7314 | | Cos(318°) | 0.7431 | | Cos(319°) | 0.7547 | | Cos(320°) | 0.766 | | Cos(321°) | 0.7771 | | Cos(322°) | 0.788 | | Cos(323°) | 0.7986 | | Cos(324°) | 0.809 | | Cos(325°) | 0.8192 | | Cos(326°) | 0.829 | | Cos(327°) | 0.8387 | | Cos(328°) | 0.848 | | Cos(329°) | 0.8572 | | Cos(330°) | 0.866 | | Cos(331°) | 0.8746 | | Cos(332°) | 0.8829 | | Cos(333°) | 0.891 | | Cos(334°) | 0.8988 | | Cos(335°) | 0.9063 | | Cos(336°) | 0.9135 | | Cos(337°) | 0.9205 | | Cos(338°) | 0.9272 | | Cos(339°) | 0.9336 | | Cos(340°) | 0.9397 | | Cos(341°) | 0.9455 | | Cos(342°) | 0.9511 | | Cos(343°) | 0.9563 | | Cos(344°) | 0.9613 | | Cos(345°) | 0.9659 | | Cos(346°) | 0.9703 | | Cos(347°) | 0.9744 | | Cos(348°) | 0.9781 | | Cos(349°) | 0.9816 | | Cos(350°) | 0.9848 | | Cos(351°) | 0.9877 | | Cos(352°) | 0.9903 | | Cos(353°) | 0.9925 | | Cos(354°) | 0.9945 | | Cos(355°) | 0.9962 | | Cos(356°) | 0.9976 | | Cos(357°) | 0.9986 | | Cos(358°) | 0.9994 | | Cos(359°) | 0.9998 | | Cos(360°) | 1 | |