Homework 10 – 4.8, 4.9

# Section 4.8

## Problem 1.

Use Algorithm 4.4 with to approximate the following double integrals, and compare the results to the exact answer.

We know that the integral will have an approximation of the following form:

Using a program:

#include <iostream>

using namespace std;

//Functions that will be used in the code.

double fxy(double, double);

double W(int, int, double, double);

int main()

{

//The end points of the integrals.

double a = 2.1, b = 2.5, c = 1.2, d = 1.4;

//The separation of the region.

int mf = 4, nf = 4;

//These are the intervals.

double h = (b - a) / mf, k = (d - c) / nf;

//Other variables.

double Total = 0;

double Integral = 0;

double x = 0, y = 0;

//Loop of the integral that will calculate the integral

for (int i = 0; i <= mf; i++)

{

x = a + h \* i;

for (int j = 0; j <= nf; j++)

{

y = c + k\* j;

Total += fxy(x, y) \* W(i, j, mf, nf);

}

}

//Multiplying the value by the correction.

Integral = ((h \* k) / 9) \* Total;

cout << "The value of the Integral f(x,y) = x\*y^2 for m = " << mf << " , n = " << nf << " is: " << Integral << endl;

return 0;

}

//This is the function of 2 variables.

double fxy(double x, double y)

{

double fxy = x \* y \* y;

return fxy;

}

//The "weight" function.

double W(int n, int m, double nf, double mf)

{

double W = 1;

//For n.

if (n == 0 || n == nf)

{

W \*= 1;

}

else if (n % 2 == 1)

{

W \*= 4;

}

else if (n % 2 == 0)

{

W \*= 2;

}

//For m.

if (m == 0 || m == mf)

{

W \*= 1;

}

else if (m % 2 == 1)

{

W \*= 4;

}

else if (m % 2 == 0)

{

W \*= 2;

}

return W;

}

We get that:



The correct value for the integral, using wolfram alpha, is:

## Problem 2.

Find the smallest values for so that Algorithm 4.4 can be used to approximate the integrals in Exercise 1 to within of the actual value.

Using the same program and seeing that when , we get that the error is what we desire.

# Section 4.9

## Problem 1.

Use Simpson’s Composite rule and the given values of to approximate the following improper integrals.

## Problem 3.

Use the transformation and then the Composite Simpson’s rule and the given value of to approximate the following improper integrals.