Test 2 Problem 2 Report

Report date

Oct 11, 2023 10:46:39 PM

Contents

1 Global Definitions

Date	Oct 11, 2023 3:06:13 PM

Global settings

Name	Jacob Leonard Test 2.mph
Path	C:\Users\jleon022\Desktop\Jacob Leonard Test 2.mph
COMSOL version	COMSOL 5.1 (Build: 145)

Used products

COMSOL Multiphysics
CAD Import Module

2 Component 1

2.1 Definitions

2.1.1 Variables

Variables 1

Selection

Geometric entity level	Entire model

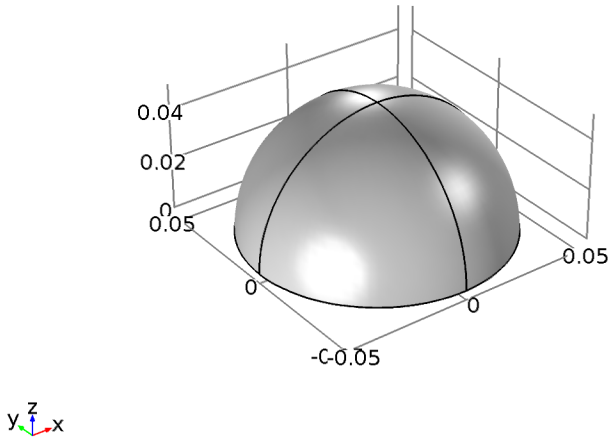
Name	Expression	Unit	Description
k0	10[W/m/K]	W/(m*K)	
CHTC	200[W/m^2/K]	W/(m^2*K)	
a	0.02[m]	m	
b	0.05[m]	m	
Ti	100[degC]	K	
g0	10^6[W/m^3]	W/m^3	

2.1.2 Coordinate Systems

Boundary System 1

Coordinate system type	Boundary system
Tag	sys1

2.2 Geometry 1



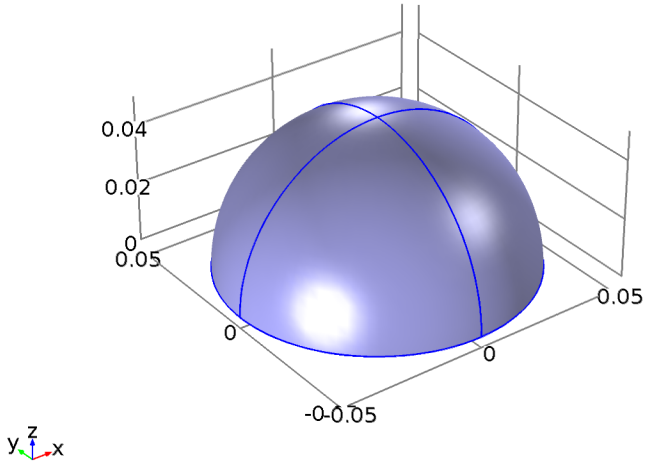
Geometry 1

Units

Length unit	m
Angular unit	deg

2.3 Materials

2.3.1 Material 1

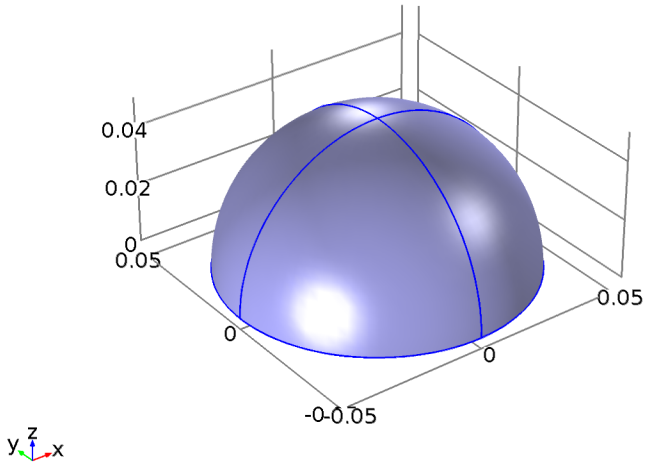


Material 1

Selection

Geometric entity level	Domain
Selection	Domain 1

2.4 Heat Transfer in Solids



Heat Transfer in Solids

Equations

$$\rho C_p \mathbf{u} \cdot \nabla T + \nabla \cdot \mathbf{q} = Q + Q_{ted}$$

$$\mathbf{q} = -k\nabla T$$

Features

Heat Transfer in Solids 1
Initial Values 1
Thermal Insulation 1
Thermal Insulation 2
Heat Flux 1
Heat Source 1

2.4.1 Heat Transfer in Solids 1

Equations

$$\rho C_p \mathbf{u} \cdot \nabla T + \underline{\nabla \cdot \mathbf{q}} = Q + Q_{ted}$$

$$\mathbf{q} = \underline{-k\nabla T}$$

2.4.2 Thermal Insulation 1

Equations

$$-\mathbf{n} \cdot \mathbf{q} = 0$$

2.4.3 Thermal Insulation 2

Equations

$$-\mathbf{n} \cdot \mathbf{q} = 0$$

2.4.4 Heat Flux 1

Equations

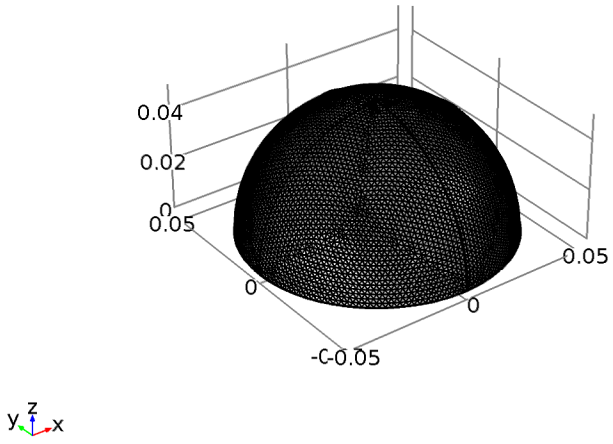
$$-\mathbf{n} \cdot \mathbf{q} = q_0$$

2.4.5 Heat Source 1

Equations

$$Q = Q_0$$

2.5 Mesh 1



Mesh 1

3 Study 1

Computation information

Computation time	26 s
CPU	Intel(R) Xeon(R) Platinum 8370C CPU @ 2.80GHz, 4 cores
Operating system	Windows Server 2012

3.1 Stationary

Study settings

Description	Value
Include geometric nonlinearity	Off

Physics and variables selection

Physics interface	Discretization
Heat Transfer in Solids (ht)	physics

Mesh selection

Geometry	Mesh
Geometry 1 (geom1)	mesh1

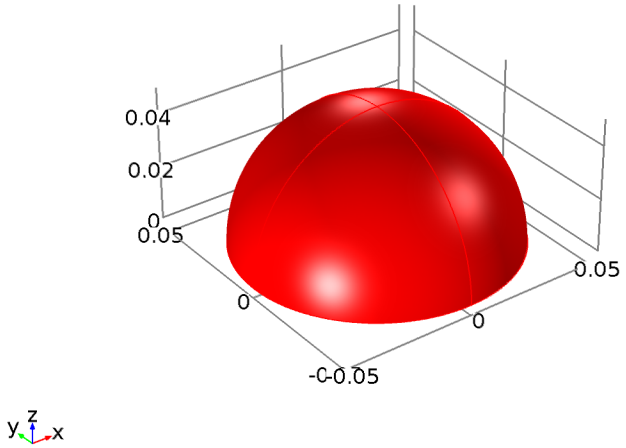
4 Results

4.1 Data Sets

4.1.1 Study 1/Solution 1

Solution

Description	Value
Solution	Solution 1
Component	Save Point Geometry 1



Data set: Study 1/Solution 1

4.1.2 Cut Line 3D 1

Data

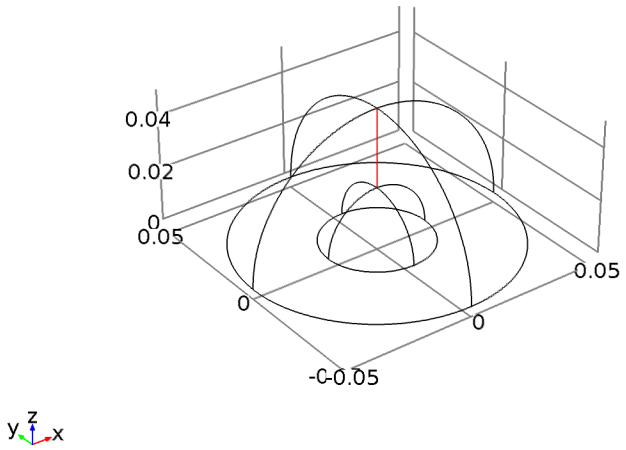
Description	Value
Data set	Study 1/Solution 1

Line data

Description	Value
Line entry method	Two points
Points	{{0, 0, 0.02}, {0, 0, 0.05}}

Advanced

Description	Value
Space variable	cln1x



Data set: Cut Line 3D 1

4.2 Derived Values

4.2.1 Surface Integration 1

Selection

Geometric entity level	Boundary
Selection	Boundaries 1, 3, 6, 9

Data

Description	Value
Data set	Study 1/Solution 1

Expression

Description	Value
Expression	ht.ndflux
Unit	W
Description	Normal conductive heat flux

4.3 Tables

4.3.1 Table 1

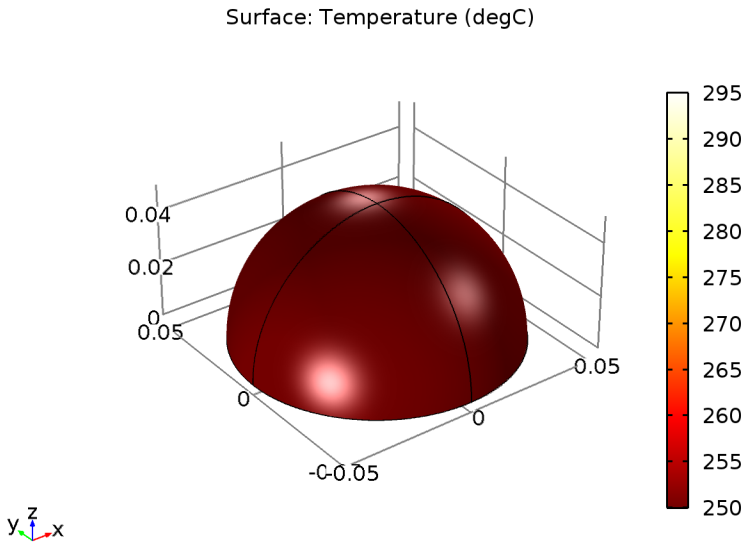
Surface Integration 1 (ht.ndflux)

Table 1

Normal conductive heat flux (W)
471.53

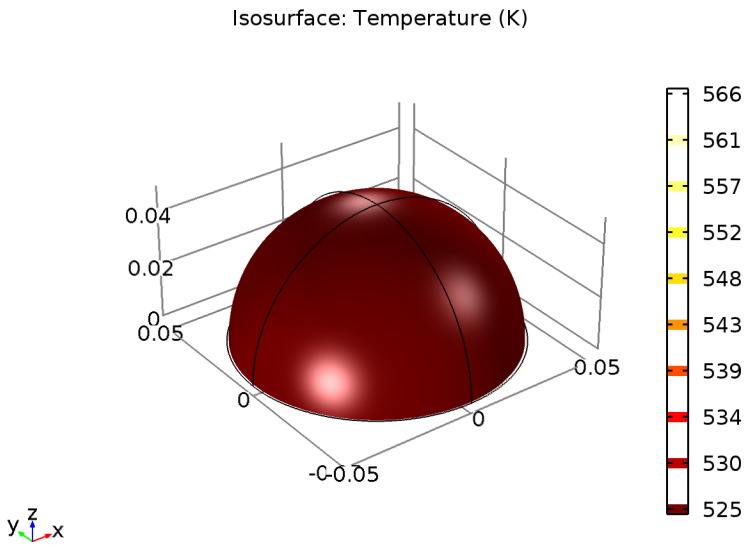
4.4 Plot Groups

4.4.1 Temperature (ht)



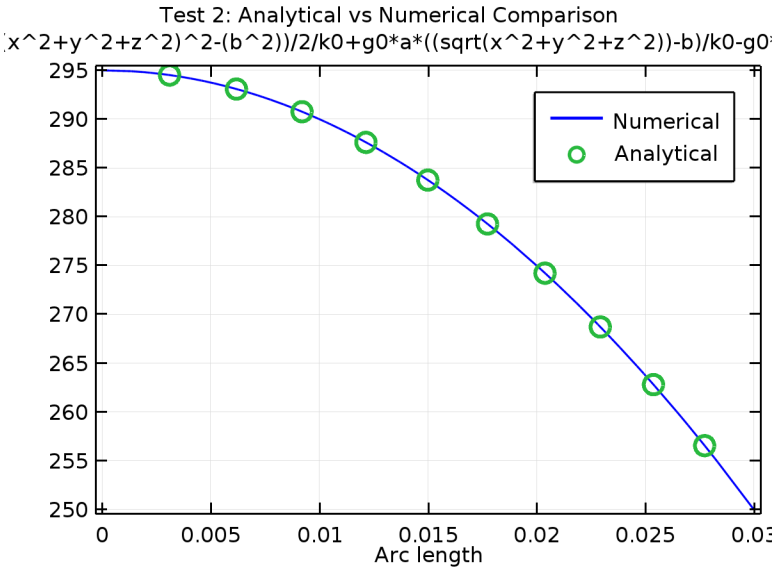
Surface: Temperature (degC)

4.4.2 Isothermal Contours (ht)



Isosurface: Temperature (K)

4.4.3 1D Plot Group 3



Test 2: Analytical vs Numerical Comparison Line Graph:
-g0(sqrt(x^2+y^2+z^2)^2-(b^2))/2/k0+g0*a*((sqrt(x^2+y^2+z^2))-b)/k0-g0*(a-b)/CHTC+Ti (degC)*