Lab 8

In this lab we were tasked to do 2 things (Randomized algorithms) Write a program to ”discover” trigonometric identities. Your program should test all combinations of the trigonometric expressions shown below and use a randomized algorithm to detect the equalities. For your equality testing, generate random numbers in the −π to π range. And (Backtracking) The partition problem consists of determining if there is a way to partition a set of integers S  
 into two subsets S1 and S2 such that 􏰁S1 = 􏰁S2.   
 Recall that S1 and S2 are a partition of S if and only if S1 ∪ S2 = S and S1 ∩ S2 = {}.  
 Write a function that solves the partition problem using backtracking. If a partition exists,   
 your program should display it; otherwise it should indicate that no partition exists.   
 For example, if S = {2, 4, 5, 9, 12}, your program should output the partition S1 = {2, 5, 9}   
 and S2 = {4, 12} and if S = {2, 4, 5, 9, 13} your program should indicate that no partition exists.

So in English terms we were to create an algorithm that generates a number between pi and -pi and then test it by inputting it into 16 different trigonometric identities testing to see which trig identity was the same as another while using the random input so what I did is create a function that multiplies an input against a list of functions so when I make my random algorithm it calls it and multiplies it within the function.

For the second function I used two functions to fulfill my objective one was to see if the set was even if it was it returned true if not false, I used this function in the main test function as the base case the first thing it tests if its odd or not if it is then automatically false if not proceed to call subset sum and your for loop.

Here are some test cases for function 1

1. your random number between -pi and pi 2.434683073765224

[0.6494870051793912, -0.7603726915816384, -0.8541692940450086, 1.5396766864085227, -0.6494870051793912, 0.7603726915816384, 0.8541692940450086, -0.6494870051793912, -0.7603726915816384, 0.8541692940450086, -0.8541692940450086, 0.6494870051793912, 0.4218333698968945, 0.42183336989689457, 0.4218333698968945, -1.315144548287126]

sin(t) = 0.6494870051793912 is equal to (2sin(t/2)cos(t/2)) = 0.6494870051793912 when t is 2.434683073765224

cos(t) = -0.7603726915816384 is equal to cos(−t) = -0.7603726915816384 when t is 2.434683073765224

tan(t) = -0.8541692940450086 is equal to (sin(t) /cos(t)) = -0.8541692940450086 when t is 2.434683073765224

−sin(t) = -0.6494870051793912 is equal to sin(−t) = -0.6494870051793912 when t is 2.434683073765224

−tan(t) = 0.8541692940450086 is equal to 9 = tan(−t) = 0.8541692940450086 when t is 2.434683073765224

(sin^2(t)) = 0.4218333698968945 is equal to (( 1−cos(2t))/2) = 0.4218333698968945 when t is 2.434683073765224

2.

your random number between -pi and pi 2.5190366858061335

[0.5831135074453335, -0.8123906926071969, -0.7177747268053423, 1.7149319767622588, -0.5831135074453335, 0.8123906926071969, 0.7177747268053423, -0.5831135074453335, -0.8123906926071969, 0.7177747268053423, -0.7177747268053423, 0.5831135074453335, 0.34002136256519905, 0.340021362565199, 0.340021362565199, -1.230934831110276]

sin(t) = 0.5831135074453335 is equal to (2sin(t/2)cos(t/2)) = 0.5831135074453335 when t is 2.5190366858061335

cos(t) = -0.8123906926071969 is equal to cos(−t) = -0.8123906926071969 when t is 2.5190366858061335

tan(t) = -0.7177747268053423 is equal to (sin(t) /cos(t)) = -0.7177747268053423 when t is 2.5190366858061335

−sin(t) = -0.5831135074453335 is equal to sin(−t) = -0.5831135074453335 when t is 2.5190366858061335

−tan(t) = 0.7177747268053423 is equal to 9 = tan(−t) = 0.7177747268053423 when t is 2.5190366858061335

(1 − cos^2 (t)) = 0.340021362565199 is equal to (( 1−cos(2t))/2) = 0.340021362565199 when t is 2.5190366858061335

Running time 0.00045800209045410156

3.

your random number between -pi and pi 2.2180162734319238

[0.7977631705412246, -0.6029709144958926, -1.3230541496486377, 1.253504845706994, -0.7977631705412246, 0.6029709144958926, 1.3230541496486377, -0.7977631705412246, -0.6029709144958926, 1.3230541496486377, -1.3230541496486377, 0.7977631705412246, 0.636426076271987, 0.636426076271987, 0.6364260762719869, -1.6584547877173137]

sin(t) = 0.7977631705412246 is equal to (2sin(t/2)cos(t/2)) = 0.7977631705412246 when t is 2.2180162734319238

cos(t) = -0.6029709144958926 is equal to cos(−t) = -0.6029709144958926 when t is 2.2180162734319238

tan(t) = -1.3230541496486377 is equal to (sin(t) /cos(t)) = -1.3230541496486377 when t is 2.2180162734319238

−sin(t) = -0.7977631705412246 is equal to sin(−t) = -0.7977631705412246 when t is 2.2180162734319238

−tan(t) = 1.3230541496486377 is equal to 9 = tan(−t) = 1.3230541496486377 when t is 2.2180162734319238

(sin^2(t)) = 0.636426076271987 is equal to (1 − cos^2 (t)) = 0.636426076271987 when t is 2.2180162734319238

Running time 0.000308990478515625

4.

your random number between -pi and pi -2.142109529344771

[-0.8411916032541482, -0.54073716962561, 1.555638581007042, -1.1887898026222585, 0.8411916032541482, 0.54073716962561, -1.555638581007042, 0.8411916032541482, -0.54073716962561, -1.555638581007042, 1.555638581007042, -0.8411916032541482, 0.7076033133852843, 0.7076033133852843, 0.7076033133852841, -1.8493272816669317]

sin(t) = -0.8411916032541482 is equal to (2sin(t/2)cos(t/2)) = -0.8411916032541482 when t is -2.142109529344771

cos(t) = -0.54073716962561 is equal to cos(−t) = -0.54073716962561 when t is -2.142109529344771

tan(t) = 1.555638581007042 is equal to (sin(t) /cos(t)) = 1.555638581007042 when t is -2.142109529344771

−sin(t) = 0.8411916032541482 is equal to sin(−t) = 0.8411916032541482 when t is -2.142109529344771

−tan(t) = -1.555638581007042 is equal to 9 = tan(−t) = -1.555638581007042 when t is -2.142109529344771

(sin^2(t)) = 0.7076033133852843 is equal to (1 − cos^2 (t)) = 0.7076033133852843 when t is -2.142109529344771

Running time 0.0004048347473144531

5.

your random number between -pi and pi -1.0638800609509076

[-0.8742457644680715, 0.48548361796216916, -1.800772945002227, -1.1438431167103713, 0.8742457644680715, -0.48548361796216916, 1.800772945002227, 0.8742457644680715, 0.48548361796216916, 1.800772945002227, -1.800772945002227, -0.8742457644680713, 0.7643056566903627, 0.7643056566903625, 0.7643056566903625, 2.059801737899061]

cos(t) = 0.48548361796216916 is equal to cos(−t) = 0.48548361796216916 when t is -1.0638800609509076

tan(t) = -1.800772945002227 is equal to (sin(t) /cos(t)) = -1.800772945002227 when t is -1.0638800609509076

−sin(t) = 0.8742457644680715 is equal to sin(−t) = 0.8742457644680715 when t is -1.0638800609509076

−tan(t) = 1.800772945002227 is equal to 9 = tan(−t) = 1.800772945002227 when t is -1.0638800609509076

(1 − cos^2 (t)) = 0.7643056566903625 is equal to (( 1−cos(2t))/2) = 0.7643056566903625 when t is -1.0638800609509076

Running time 0.00026917457580566406

Average running time : 0.4872248151314627687440 sec

And for the backtracking algorithm

s1 = [1,2,4,5,8]  
s2 = [2,6,8,10,12]  
s3 = [1,3,4,6,8,10]  
s4 = [2,3,4,6,7]  
s5 = [1,5,7,8]

s1 =([2, 8], [1, 4, 5])

Running time 1.4066696166992188e-05

S2 = no partition exist

None

Running time 2.09808349609375e-05

S3 = ([6, 10], [1, 3, 4, 8])

Running time 1.0013580322265625e-05

S4 = ([4, 7], [2, 3, 6])

Running time 9.775161743164062e-06

S5 = No Partition exist

None

Running time 9.298324584960938e-06

Of all the labs besides the maze I think this is my favourite I knew exactly what to do the errors that I did encounter were mainly syntax errors nothing major

I Adrian Monreal certify that this project is entirely my own work. I

wrote, debugged, and tested the code being presented, performed the experiments, and wrote the report. I also

certify that I did not share my code or report or provided inappropriate assistance to any student in the class.