**Submission Instruction:** Please submit this homework on Canvas in a single pdf format. The filename should be "HWXX\_FullName\_RedID.pdf" (ex. HW01\_JamesGault\_12345678.pdf).

Please copy your Matlab code in the given box. Adjust the box size as needed.

Please also submit all your m files separately. **Don’t zip them**.

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**Converting Binary Numbers to Decimal Numbers**

1. Convert the binary number 1001001 to a decimal number. (point: / 5)

1001001 = 64+8+1 = 73

**Converting Decimal Numbers to Binary Numbers**

1. Convert the decimal number 55 to a binary number. ( / 5)  
     
   55 = 32+16+4+2+1 = 110111

**Variables in MATLAB**

1. What value will be assigned to the variables “x” and “y” at the end of this code? ( / 5)

x = 7;

x = x+7;

y = 2;

y = y + 5;

y = x + y;

x = 14, y = 21

1. What value will be assigned to the variables “h”, “g”, and “f” at the end of this code? ( / 5)

h = 5;

g = 20 – 2\*h;

f = 2\*g – 2\*h;

f = f - h;

h = 5, g = 10, f = 5

**Local vs. Global Variables**

1. What will be the values of “x”, “y”, “a”, “c”, “d”, and “e” be after running this code? ( / 5)

Function:

function [x, y, z] = myVariableTracker2 (a, b, c, d)

x = a + b + c;

y = x/d;

z = x + y;

end

Script:

% Using myVariableTracker2

b = 1;

c = 1;

d = 4;

e = 2;

[x, y, d] = myVariableTracker2(b,c,d,e);

X = 6, y = 3, b = 1, c = 1, d = 9, e = 2, a = Undefined

1. What will be the values of “a”, “b”, “c”, “x”, “y”, and “z” be after running this code? ( / 5)

Function:

function [a, b, c] = myVariableTracker3(x, y, z)

a = x - y;

b = a + z;

c = a + b;

c = c + 2;

end

Script:

% Using myVariableTracker3

x = 1;

a = 2;

b = 3;

[a, x, y] = myVariableTracker3(x, a, b);

a = -1, b = 3, x = 2, y = 3, c = Undefined, z = Undefined

**Numerical Expressions (Write your code in the box.)**

1. A very powerful approximation for π was developed by a brilliant mathematician named Srinivasa Ramanujan. The approximation is the following:

Write a function with header[mypi] = myApproximationPI(N) to use Ramanujan’s formula for N = 1 to approximate π. Be sure to use format long. Compare your approximation with MATLAB’s stored value for pi. Hint: 0! = 1 by definition. Use MATLAB’s ***factorial*** function. ( / 10)

Function:

function [mypi] = myApproximationPI(N)

format long

totalSum = 0;

for k = 0:N

totalSum = totalSum + ((factorial(4\*k))\*(1103+26390\*k))/(((factorial(k))^4)\*(396^(4\*k)));

end

mypi = ((2\*sqrt(2)/9801)\*totalSum)^(-1)end

Script:

format long

N = 1;

myPi = myApproximationPI(N);

piDif = abs(myPi - pi);

fprintf("\nMy approximation of pi is: %.20f\n",myPi)

fprintf("Matlab's stored approximation of pi is: %.20f\n",pi)

fprintf("The difference between my approximation and Matlab's is: %.20f or %.5e\n\n",piDif,piDif)

**Functions (Write your code in the box.)**

1. Write a function with header [A] = myTriangle(b,h) where A is the area of a triangle with base, b, and height, h. Recall that the area of a triangle is one half the base times the height. You may assume that b and h are 1×1 doubles. ( / 15)

Test Cases:

>> a = myTriangle(1,1)

a= 0.5000

>> a = myTriangle(2,1)

a= 1

>> a = myTriangle(12,5)

a = 30

function [A] = myTriangle(b,h)

A = .5\*b\*h;

end

1. Write a function with header [S,V] = myCylinder(r,h) where r and h are the radius and height of a cylinder, respectively, and S and V are the surface area and volume of the same cylinder. Recall that the surface area of a cylinder is , and the volume is . You may assume that r and h are 1 × 1 doubles. ( / 15)

Test Cases:

>> [S, V] = myCylinder(1, 5)

S = 37.6991

V = 15.7080

>> [S, V] = myCylinder(2, 3)

S = 62.8319

V = 37.6991

function [S,V] = myCylinder(r,h)

S = 2\*pi\*r^2 + 2\*pi\*r\*h

V = pi\*r^2\*h

end

**Branching (Write your code in the box.)**

1. Write a function with header [tip] = myTipCalc(bill, party) where bill is the total cost of a meal and party is the number of people in the group. The tip should be calculated as 15% for a party strictly less than 6 people, 18% for a party strictly less than 8, 20% for a party less than 11, and 25% for a party 11 or bigger. ( / 15)

Test Cases:

>> t = myTipCalc(109.29,3)

t= 16.3935

>> t = myTipCalc(109.29,7)

t= 19.6722

>> t = myTipCalc(109.29,9)

t = 21.8580

>> t = myTipCalc(109.29,12)

t= 27.3225

function [tip] = myTipCalc(bill, party)

if ( party < 6)

tip = .15\*bill

elseif (party < 8)

tip = .18\*bill

elseif (party < 11)

tip = .20\*bill

else

tip = .25\*bill

end

1. Consider a triangle with vertices at (0,0), (1,0), and (0,1). Write a function with header  
   [S] = myInsideTriangle(x,y) where S is the string 'outside' if the point (x,y) is outside of the triangle, 'border' if the point is exactly on the border of the triangle, and 'inside' if the point is on the inside of the triangle. ( / 15)

Test Cases:

>> S = myInsideTriangle (.5,.5)

S = border

>> S = myInsideTriangle (.25,.25)

S= inside

>> S = myInsideTriangle (5,5)

S = outside

function [S] = myInsideTriangle(x,y)

if (x + y == 1)

S = ‘border’

elseif (x + y < 1)

S = ‘inside’

elseif (x + y > 1)

S = ‘outside’

end

end