Table of Contents


```
function [fluidVol] = PS07_tankVolume_koike(orientation, fluidHeight)

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENGR 132
% Program Description
% This program is designed to calculate the volume of fluid inside
% a horizontal and vertical cylindrical tank with hemispherical end
% caps.
%
% Function Call
% PS07_tankVolume_koike(orientation, fluidHeight)
%
% Input Arguments
% 1. orientation: the orientation of the tank which are horizontal
%    and vertical
% 2. fluidHeight: the height of the fluid inside the tank
%
% Output Arguments
% 1. fluidVol: the volume of the fluid
%
% Assignment Information
%   Assignment:        PS 07, Problem 3
%   Author:             Tomoki Koike , koike@purdue.edu
%   Team ID:            002-08
%   Contributor:   Name, login@purdue [repeat for each]
%   My contributor(s) helped me:
%     [ ] understand the assignment expectations without
%         telling me how they will approach it.
%     [ ] understand different ways to think about a solution
%         without helping me plan my solution.
%     [ ] think through the meaning of a specific error or
%         bug present in my code without looking at my code.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

INITIALIZATION

```
% for the academic integrity statement
nameArray = ["Tomoki Koike"];

% setting variables for constant values of the tank
tankR = 3.35 / 2;   %the radius of the hemispherical part of tank (m)
tankCenterL = 21.1 - 3.35;       %the length of the cylindrical center
                                 %of the tank (m)

% the different ranges of the fluid height for when the
% tank is in vertical orientation

%when the fluid height goes up to the top hemisphere
upToTopHemis = (orientation == "vertical")&((tankR +
 tankCenterL)<=fluidHeight)&(fluidHeight<=(2*tankR + tankCenterL));
%when the fluid height is in between the cylindrical section
upToCylinder = (orientation
 == "vertical")&(tankR<=fluidHeight)&(fluidHeight<=(tankR +
 tankCenterL));
%when the fluid height is only in the low hemisphere
upToLowHemis = (orientation
 == "vertical")&(0<=fluidHeight)&(fluidHeight<=tankR);

%the condition for the horizontal orientation
horzOrient = (orientation == "horizontal")&(0<=fluidHeight &
 fluidHeight<=2*tankR);
%the condition for the vertcial orientation
vertOrient = (orientation == "vertical")&(0<=fluidHeight &
 fluidHeight<=(2*tankR + tankCenterL));
```

CALCULATIONS, STRUCTURE, & TEXT DISPLAYS

```
% the calculation for the fluid volume for each orientation and
% conditions

% for the vertical upToLowHemis condition
vertLowHemisVol = (pi*(fluidHeight^2)*(3*tankR - fluidHeight))/3;
% for the vertical upToCylinder condition
vertCylinderVol = 2*pi*(tankR^3)/3 + pi*(tankR^2)*(fluidHeight -
 tankR);
% for the vertical upToTopHemis condition
vertTopHemisVol = pi*(tankR^2)*tankCenterL + pi*((fluidHeight -
 tankCenterL)^2)*(3*tankR - fluidHeight + tankCenterL)/3;
```

```
% for the horizontal orientation
horzVol = vertLowHemisVol + tankCenterL*((tankR^2)*acos((tankR -
 fluidHeight)/tankR) - (tankR - fluidHeight)*sqrt(2*tankR*fluidHeight
 - (fluidHeight^2)));

% the selection structure

    if ~(horzOrient || vertOrient)
        fluidVol = -1;
        fprintf('\nError: Improper orientaion or fluid height inputted
 (orientation only accepts horizontal or vertical, case-sensitive)\n
\n');
    elseif horzOrient
        fluidVol = horzVol;
        fprintf('\nThe volume of the fluid in the tank is %.4f m^3.\n
\n',fluidVol);
    elseif upToTopHemis
        fluidVol = vertTopHemisVol;
        fprintf('\nThe volume of the fluid in the tank is %.4f m^3.\n
\n',fluidVol);
    elseif upToCylinder
        fluidVol = vertCylinderVol;
        fprintf('\nThe volume of the fluid in the tank is %.4f m^3.\n
\n',fluidVol);
    elseif upToLowHemis
        fluidVol = vertLowHemisVol;
        fprintf('\nThe volume of the fluid in the tank is %.4f m^3.\n
\n',fluidVol);
    else
        fluidVol = -1;
        fprintf('\nError: Unexpected error occuring\n\n');
    end


The volume of the fluid in the tank is 39.1494 m^3.
```

COMMAND WINDOW OUTPUTS

```
%orientation = "horizontal";
%PS07_tankVolume_koike(orientation, 2.5)

%The volume of the fluid in the tank is 141.7453 m^3.

%I am submitting code that is my own original work. I have not used
%source code, either modified or unmodified, obtained from any
%unauthorized source. Neither have I provided access to my code to any
%peer or unauthorized source. Signed,
%<Tomoki Koike>

%ans =
```

```
%  141.7453

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%orientation = "vertical";

%PS07_tankVolume_koike(orientation, 1.5)

%The volume of the fluid in the tank is 8.3056 m^3.

%I am submitting code that is my own original work. I have not used
%source code, either modified or unmodified, obtained from any
%unauthorized source. Neither have I provided access to my code to any
%peer or unauthorized source. Signed,
%<Tomoki Koike>

%ans =

%    8.3056

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%PS07_tankVolume_koike(orientation, 10.33)

%The volume of the fluid in the tank is 86.1287 m^3.

%I am submitting code that is my own original work. I have not used
%source code, either modified or unmodified, obtained from any
%unauthorized source. Neither have I provided access to my code to any
%peer or unauthorized source. Signed,
%<Tomoki Koike>

%ans =

%   86.1287

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%PS07_tankVolume_koike(orientation, 17.59)

%The volume of the fluid in the tank is 150.1193 m^3.

%I am submitting code that is my own original work. I have not used
%source code, either modified or unmodified, obtained from any
%unauthorized source. Neither have I provided access to my code to any
%peer or unauthorized source. Signed,
%<Tomoki Koike>

%ans =

%  150.1193

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

```
%PS07_tankVolume_koike(orientation, 20)

%The volume of the fluid in the tank is 171.1623 m^3.

%I am submitting code that is my own original work. I have not used
%source code, either modified or unmodified, obtained from any
%unauthorized source. Neither have I provided access to my code to any
%peer or unauthorized source. Signed,
%<Tomoki Koike>

%ans =

%  171.1623

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%orientation = "h";
%PS07_tankVolume_koike(orientation, 15)

%Error: Improper orientaion or fluid height inputted (orientation only
 accepts horizontal or vertical, case-sensitive)

%I am submitting code that is my own original work. I have not used
%source code, either modified or unmodified, obtained from any
%unauthorized source. Neither have I provided access to my code to any
%peer or unauthorized source. Signed,
%<Tomoki Koike>

%ans =

%    -1
```

ACADEMIC INTEGRITY STATEMENT

```
% Call your Academic Integrity function from problem 2
PS07_academic_integrity_koike(nameArray);
```

I am submitting code that is my own original work. I have not used source code, either modified or unmodified, obtained from any unauthorized source. Neither have I provided access to my code to any peer or unauthorized source. Signed,
<Tomoki Koike>

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