

MTH233

Double Integrals

Project 4– Exercises

NAME: _____
 SECTION: _____
 INSTRUCTOR: _____

Exercise 1:

Use MATLAB to plot the boundary of the region in the xy -plane which is represented in the integrals below. Use MATLAB to compute the double integral. Then reverse the order of the integrals and write the bounds for the reverse order of integration. Use MATLAB to compute the new double integral. You should obtain the same answer either way.

Part A Find the values for a, b, c and d (and use for the following)

$$\int_0^9 \int_{\sqrt{x}}^3 x^2 + y^2 dy dx = \int_a^b \int_c^d x^2 + y^2 dx dy$$

- a1.) Generate a graph which shows the region in the xy plane:
 (1) Attach your graph to the worksheet.

Assume for the following that we have defined:

```
>> syms x y
>> f=x^2+y^2
```

- a2.) What is the MATLAB command that integrates

$$\int_0^9 \int_{\sqrt{x}}^3 x^2 + y^2 dy dx$$

(2) Circle one:

1. `int(int(f,x,sqrt(x),3),y,0,9)`
2. `int(int(f,y,0,9),x,sqrt(x),3)`
3. `int(int(f,y,3,sqrt(x)),x,9,0)`
4. `int(int(f,y,sqrt(x),3),x,0,9)`

a3.) Now find the bounds, a, b, c and d for the reverse the order of integration.

$$\int_a^b \int_c^d x^2 + y^2 dx dy$$

What MATLAB command evaluates this integral?

(3) Circle one:

1. `int(int(f,y,0,3),x,0,y^2)`
2. `int(int(f,x,0,y^2),y,0,3)`
3. `int(int(f,y,0,y^2),x,0,3)`
4. `int(int(f,x,0,3),y,0,y^2)`

a4.) What answer did MATLAB give?

(4) Answer: _____

Part B Find the values for a, b, c, d, e, f, g and h (and use for the following)

$$\int_0^1 \int_{2-x}^{x+2} x^2 + y^2 dy dx + \int_1^2 \int_{2-x}^{4-x^2} x^2 + y^2 dy dx = \int_a^b \int_c^d x^2 + y^2 dx dy + \int_e^f \int_g^h x^2 + y^2 dx dy$$

b1.) Generate a graph which shows the region in the xy plane:

(5) Attach your graph to the worksheet.

b2.) What is the MATLAB command that integrates $\int_0^1 \int_{2-x}^{x+2} x^2 + y^2 dy dx + \int_1^2 \int_{2-x}^{4-x^2} x^2 + y^2 dy dx$

(6) Circle one:

1. `int(int(f,y,2-x,4-x^2),x,1,2)+int(int(f,y,2-x,x+2),x,0,1)`
2. `int(int(f,y,x-2,4-x^2),x,0,1)+int(int(f,y,x-2,x+2),x,1,2)`
3. `int(int(f,y,2-x,x+2),x,1,2)+int(int(f,y,2-x,4-x^2),x,0,1)`
4. not listed

b3.) What is the MATLAB command that integrates

$$\int_a^b \int_c^d x^2 + y^2 dx dy + \int_e^f \int_g^h x^2 + y^2 dx dy$$

use the bounds you found for a, b, c, d, e, f, g, h

(7) Circle one:

1. `int(int(f,x,y-2,sqrt(4-y)),y,0,2)+int(int(f,x,2-y,sqrt(4-y)),y,2,3)`
2. `int(int(f,y,2-y,sqrt(4-y)),x,0,2)+int(int(f,y,y-2,sqrt(4-y)),x,2,3)`
3. `int(int(f,x,2-y,sqrt(4-y)),y,0,2)+int(int(f,x,y-2,sqrt(4-y)),y,2,3)`
4. not listed

b4.) What answer did MATLAB give?

(8) Answer: _____

Exercise 2:

a.) Use MATLAB to plot the volume bounded by

$$z = 20e^{x^3/8}, y = 0, y = x^2, \text{ and } x = 2$$

Use view and axis to get a good orientation that shows both the surface and the region in the xy -plane. Label the graph with a title indicating what view you used. Use `title('view(?)')` to do this.

(9) Attach your graph to the worksheet.

b.) Set up the double integral needed to compute the volume under the surface and above the region in the xy -plane, as given in part (a), and find this volume using MATLAB.

What is the MATLAB command you used to compute this integral? Assume `syms x y` and `f=20*exp(x^3/8)` have been defined. *Hint: One order of integration is “non-integrable”! Is it x – simple or y – simple?*

(10) Answer:

c.) What is the numerical value for the volume?

(11) Answer: _____

Exercise 3:

a.) Use MATLAB to plot the solid bounded by

$$z = 54e^{-(x^2+y^2)/4}, z = 0, \text{ and } x^2 + y^2 = 16$$

Use view and axis to get a good orientation that shows both the surface and the region in the xy -plane. Label the graph with a title indicating what view you used. Use `title('view(?)')` to do this. **(12) Attach your graph to the worksheet.**

b.) Set up the double integral needed to compute the volume under the surface and above the region in the xy -plane, as given in part (a), and find this volume using MATLAB.

What is the numerical value for the volume?

(13) Answer: _____