

Calculus mini-project 3: “Applications of plane integrals”

First year of study at the Faculty of Engineering and Science
and
the Faculty of Medicine

This mini project is concerned with the application of plane integrals to calculate mass and center of mass for laminas (thin plates). The calculation of mass and center of mass for more general spatial bodies is treated later on in the course through space integrals.

Agenda for the day:

- Read section 13.5 in E&P (skip from p.1031 to p.1033 example 8 included) about applications of plane integrals.
- Solve the following problems
 - o True/False study guide 12.5, p.1035 (questions related to the Theorems of Pappus are skipped)
 - o Problems: 3, 5, 9, 11, 13, 17, 23, 29 & 35.

Maple and Matlab can be used to evaluate plane integrals once the integrals are rewritten as iterated integrals. As an example consider

$$\int_1^2 \int_0^x x^2 \cdot y^3 dy dx$$

In Maple this integral is evaluated using the command

```
>int(x^2*y^3,y=0..x,x=1..2)
```

In Matlab use the commands

```
>> syms x y
```

```
int(int(x^2*y^2,y,0,x),x,1,2)
```