

Calc 2

Mobile Project Stage 1: Shapes

Objective:

The objective of this first stage is to help you decide what shapes you want to use in the construction of your mobile.

You will determine a technique for the calculation of the areas of figures that guarantees they have the area required, decide on shapes you may want to use, determine the correct dimensions for the mobile, draw the shapes in *Mathematica*, and cut out samples.

Mobile shape requirements:

- Use same type material for both shapes
- Use at least two different shapes
- At least one of the shapes has to have a hole

Instructions

Stage 1 of the project is worth 15 points:

5 points: Group presentation and solution to questions in example 1.

5 points: Group presentation and solution to questions in example 2.

5 points: Individual submission of *Mathematica* drawings, sample shapes and typed area calculations.

Group points will be assigned as follows:

2 points: Correctness and completeness of solution (judged from written solution turned in by the group)

2 point: Clarity and technique of solution (judged from written solution and presentation)

1 point: Participation in presentation and solution (judged from written solution and presentation)

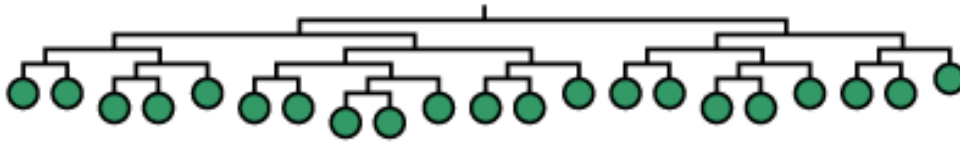
Individual points will be assigned as follows, provided a typed up solution is turned in:

1 point: Correctness and completeness of computations

2 point: Originality

1 point: Mathematica drawings

1 point: Sample shapes for mobile

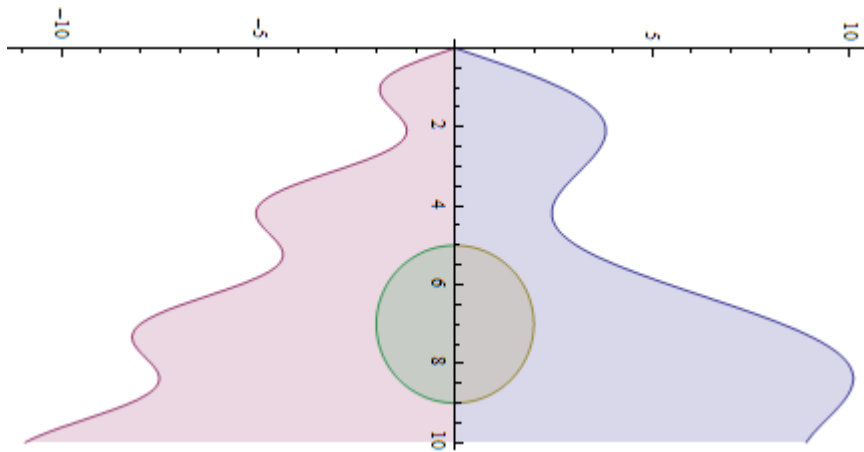


Second Example

Suppose this rotated *Mathematica* graph represent one of the shapes you will use for your mobile. Let's call it **Shape A**.

The command used to create the picture is shown below (in case it comes in handy ☺):

```
Plot[{2Sin[x] + x, -Sin[2x] - x,  $\sqrt{4 - (x - 7)^2}$ ,  $-\sqrt{4 - (x - 7)^2}$ }, {x, 0, 10},
Filling -> Axis, AxesOrigin -> {0, 0}, AspectRatio -> Automatic]
```



Exploration

In this exploration you can use mathematica as much as you like.

1. If the circle in the middle represents the hole in **Shape A**, what is the area of **Shape A**?
2. Create one regular shape with a hole of different shape and size that has the same area.
3. Create a non-regular shape with or without hole(s) that has the same area. Be explicit about the functions that generate the shape and show the computations that establish your new shape has the same area as the shape above.
4. What do you think can be learned from this example that will be useful to build your mobile?