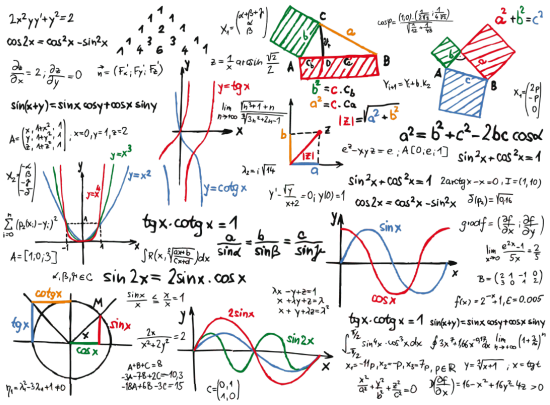
B5 - Mathematics

B-MAT-500

308reedpipes

Numerical Machine and Cubic Splines



308reedpipes

binary name:	308reedpipes
repository name:	308reedpipes_*$ACADEMIC_YEAR*
repository rights:	ramassage-tek
language:	everything working on "the dump"
compilation:	when necessary, via Makefile, including re, clean and fclean rules

- Your repository must contain the totality of your source files, but no useless files (binary, temp files, obj files,...).
- All the bonus files (including a potential specific Makefile) should be in a directory named *bonus*.
- Error messages have to be written on the error output, and the program should then exit with the 84 error code (0 if there is no error).

Having been a reed pipe enthusiast for a long time now, your cousin cobbled together a little numerically controlled machine that will enable him to carry out a serial production of reed pipes and make a business out of it. However, he would like a software so that he can design his pipes himself…

So, you have to create a program for him that, starting from the pipe's radius (in cm) with abscissas 0, 5, 10, 15 and 20 cm, and using cubic splines, displays the radii of n points that are evenly distributed along the pipe. In order to simplify the debugging process, you will also display the resolved linear system's vector result in order to obtain the spline.

USAGE

Terminal

```
~/B-MAT-500> ./308reedpipes -h
USAGE
    ./308reedpipes r0 r5 r10 r15 r20 n

DESCRIPTION
    r0      radius (in cm) of pipe at the 0cm abscissa
    r5      radius (in cm) of pipe at the 5cm abscissa
    r10     radius (in cm) of pipe at the 10cm abscissa
    r15     radius (in cm) of pipe at the 15cm abscissa
    r20     radius (in cm) of pipe at the 20cm abscissa
    n       number of points needed to display the radius
```

Obviously, libraries that manage the splines are unauthorized…

Suggested Bonus

- Choosing among several types of splines,
- A 2D graphical display…
- …or 3D,
- A full software to design the pipe.

Examples

Terminal

```
~/B-MAT-500> ./308reedpipes 1.5 2 2 2 5 11
vector result: [0.0, 0.0, 0.0, 0.2, 0.0]
abscissa: 0.0 cm        radius: 1.5 cm
abscissa: 2.0 cm        radius: 1.7 cm
abscissa: 4.0 cm        radius: 1.9 cm
abscissa: 6.0 cm        radius: 2.1 cm
abscissa: 8.0 cm        radius: 2.1 cm
abscissa: 10.0 cm       radius: 2.0 cm
abscissa: 12.0 cm       radius: 1.8 cm
abscissa: 14.0 cm       radius: 1.8 cm
abscissa: 16.0 cm       radius: 2.4 cm
abscissa: 18.0 cm       radius: 3.5 cm
abscissa: 20.0 cm       radius: 5.0 cm
```

Terminal

```
~/B-MAT-500> ./308reedpipes 2 3 2 4 5 13
vector result: [0.0, -0.2, 0.3, -0.1, 0.0]
abscissa: 0.0 cm        radius: 2.0 cm
abscissa: 1.7 cm        radius: 2.6 cm
abscissa: 3.3 cm        radius: 3.0 cm
abscissa: 5.0 cm        radius: 3.0 cm
abscissa: 6.7 cm        radius: 2.6 cm
abscissa: 8.3 cm        radius: 2.2 cm
abscissa: 10.0 cm       radius: 2.0 cm
abscissa: 11.7 cm       radius: 2.4 cm
abscissa: 13.3 cm       radius: 3.2 cm
abscissa: 15.0 cm       radius: 4.0 cm
abscissa: 16.7 cm       radius: 4.5 cm
abscissa: 18.3 cm       radius: 4.8 cm
abscissa: 20.0 cm       radius: 5.0 cm
```