

# Approximate Double Integrals<sup>1</sup>

1. Go to the O.U. MATLAB website ([www.math.ohiou.edu/~matlab](http://www.math.ohiou.edu/~matlab)). In 263D, under this assignment, click on: `lowerleft.m`  
This will download a program file; save it to your working directory.

2. Open MATLAB. In the command window, check the current directory, and if needed, change to the directory where you saved `lowerleft.m`.

3. In the command window, type the following commands:

```
format long
f = inline('x*y^2', 'x', 'y')
lowerleft(f, 0, 1, 0, 2, 10, 20)
```

MATLAB should return the answer 1.11150000000000. Calculate the integral exactly by hand and find the % error.

4. Click on the file icon at the upper left corner and open the file `lowerleft.m`, this will be the program that was used in the command above by the same name. Read the program and comments.

5. Save the program as `centerpoint.m`. Modify it to do Riemann sums using the centerpoint rather than the lowerleft point. You will need to change the name of the function in the first line to `centerpoint`, otherwise, you will need to change very little.

6. Test your new program on  $f(x, y) = xy^2$  by typing:

```
centerpoint(f, 0, 1, 0, 2, 10, 20)
```

This answer should be closer to the correct answer than `lowerleft`. Test this using the % error.

7. Try out your new program on the following integral:

$$\int_0^2 \int_0^5 \sqrt{xy + y^5 + x^2} dy dx$$

Also, try this integral using the command `dblquad` as in the previous homework. For `m` and `n` fairly large, does your program come close to MATLAB's built in program?

8. Using complete sentences and standard mathematical notation, write a brief report.

This assignment gives students a chance to work with Riemann sums and gives a very gentle introduction to programming in MATLAB.

---

<sup>1</sup>Copyright ©2002 Todd Young. All rights reserved. Please address comments to [young@math.ohiou.edu](mailto:young@math.ohiou.edu).