This week on the problem set we will see examples of integrals over more general regions.

You will only need to hand in a small selection of the questions for homework, however I recommend that you at least attempt them all by the end of the quarter as some may appear on exams!

Homework: The first homework will be due on Friday 20 January, at 12pm, the *start* of the lecture. It will consist of questions:

14 (from problem set 1), 6 and 8

*Numbers in parentheses indicate the question has been taken from the textbook:

J. Rogawski, C. Adams, *Calculus, Multivariable*, 3rd Ed., W. H. Freeman & Company,

and refer to the section and question number in the textbook.

1. (16.2.4) Sketch the domain
$$\mathcal{D}:\ 0 \leq x \leq 1, \quad x^2 \leq y \leq 4 - x^2$$
and evaluate $\iint_{\mathcal{D}} y \, \mathrm{d}A$ as an iterated integral.

2. (16.2.8) Sketch the domain $\mathcal{D}$ defined by $x + y \leq 12, x \geq 4, y \geq 4$ and compute $\iint_{\mathcal{D}} e^{x+y} \, \mathrm{d}A$.

3. (16.2.14) Integrate $f(x, y) = (x + y + 1)^{-2}$ over the triangle with vertices $(0, 0), (4, 0)$ and $(0, 8)$.

4. (16.2) In the following exercises compute the double integral of $f(x, y)$ over the domain $\mathcal{D}$ indicated.
   (a) (16.1.20) $f(x, y) = \cos(2x + y)$; $\quad \frac{1}{2} \leq x \leq \frac{\pi}{2}, 1 \leq y \leq 2x$
   (b) (16.1.21) $f(x, y) = 2xy$; bounded by $x = y, x = y^2$.
   (c) (16.1.23) $f(x, y) = e^{x+y}$; bounded by $y = x - 1, y = 12 - x$ for $2 \leq y \leq 4$.

5. (16.2.29) Sketch the domain $\mathcal{D}$ corresponding to
$$\int_0^4 \int_{\sqrt{y}}^2 \sqrt{4x^2 + 5y} \, \mathrm{d}x \, \mathrm{d}y$$

6. (16.1.31) Compute the integral of $f(x, y) = (\ln y)^{-1}$ over the domain $\mathcal{D}$ bounded by $y = e^x$ and $y = e^{\sqrt{x}}$.
   Hint: Choose the order of integration that enables you to evaluate the integral.

7. (16.2.45) Find the volume of the region bounded by $z = 40 - 10y$, $z = 0, y = 0$ and $y = 4 - x^2$.

8. (16.2.48) Find the volume of the region bounded by $y = 1 - x^2$, $z = 1, y = 0$ and $z + y = 2$.

9. (16.2.49) Set up a double integral that gives the volume of the region bounded by the two paraboloids $z = x^2 + y^2$ and $z = 8 - x^2 - y^2$. (Do not evaluate the integral.)