

This week on the problem set you will get practice applying and understanding Green's theorem and Stokes' theorem.

Homework: The homework will be due on Friday 5 June. It will consist of questions 3, 4, 5 below.

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

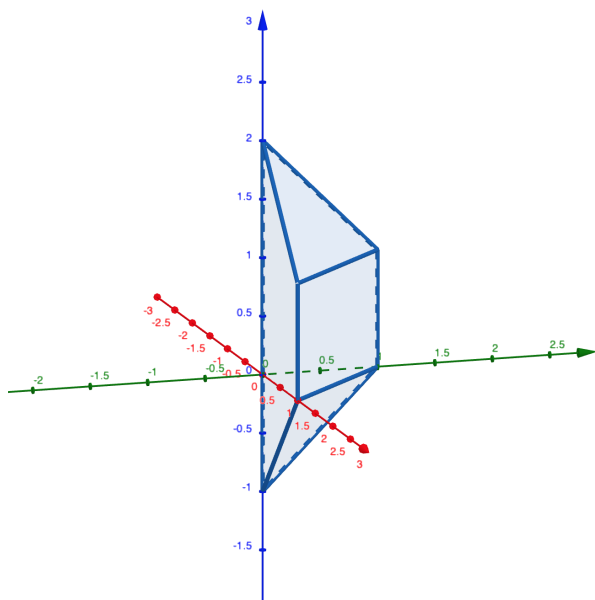
J. Rogawski, C. Adams, *Calculus, Multivariable*, 3rd Ed., W. H. Freeman & Company,

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

- (Section 18.1) 3, 7, 8, 9, 12, 19, 20, 21, 23, 24, 25, 29, 36*, 41, 45. (Use the following translations 4th \mapsto 3rd editions: 7 \mapsto 5, 8 \mapsto 6, 9 \mapsto 7, 12 \mapsto 10, 19 \mapsto 15, 20 \mapsto 16, 21 \mapsto 17, 23 \mapsto 19, 24 \mapsto 20, 25 \mapsto 21, 29 \mapsto 25, 36 \mapsto 32, 41 \mapsto 37, 45 \mapsto 41 otherwise the questions are the same).
- (Section 18.2) 5, 8, 9, 18, 19. (Use the following translations 4th \mapsto 3rd editions: 18 \mapsto 16, 19 \mapsto 17, otherwise the questions are the same).
- Let $\mathbf{F}(x, y, z) = \langle x, x + y^3, x^2 + y^2 - z \rangle$ and let S be the surface $z = x^2 - y^2$ where $x^2 + y^2 \leq 1$ with upward orientation and positively oriented boundary \mathcal{C} . Find $\int_{\mathcal{C}} \mathbf{F} \cdot d\mathbf{r}$.
- Let $\mathbf{F} = \langle x, y, -2z + e^{x^4+y^2} \rangle$ and let S be the part of the hyperboloid $x^2 + y^2 = 1 + z^2$ where $z^2 \leq 3$ oriented so that at points with positive z values the z coordinate of the normal vector is negative (i.e. with outward pointing normal). What is $\iint_S \mathbf{F} \cdot d\mathbf{S}$?

Hint: Find a simpler surface with the same boundary.

- Consider the 3 dimensional polyhedron pictured below with vertices



(0, 0, -2)
 (0, 0, 4)
 (0, 1, 0)
 (1, 0, 0)
 (0, 1, 1)
 (1, 0, 1)

with outward pointing orientation. Find the flux of $\mathbf{F} = \langle 2x^2 - 3xy^2, xz^2e^z + y^3, \sin(x^2 + y^2) \rangle$ through S .

*The questions marked with an asterisk are more difficult or are of a form that would not appear on an exam. Nonetheless they are worth thinking about as they often test understanding at a deeper conceptual level.