SM223 – Calculus III with Optimization Fall 2017
Assoc. Prof. Nelson Uhan

Exam 1 – Information and Review Problems

1 Information

- When: Friday 8 September, in class
- What: Lessons 1 - 10 (Sections 12.1 - 12.6 in Stewart)
- No outside materials (e.g. notes, homework, books) allowed
- No calculators allowed
- Review on Thursday 7 September
  - We will discuss some of the problems below, as well as any questions that you might have
- EI on Thursday 7 September, 19:00 - 20:00, CH348

2 Review Problems

Note: these problems together are not meant to represent the total length of the exam.

Problem 1. Let

$$\vec{a} = \vec{i} + \vec{j} - 2\vec{k} \qquad \vec{b} = 3\vec{i} - 2\vec{j} + \vec{k} \qquad \vec{c} = \vec{j} - 5\vec{k}$$

Compute the following quantities:

a. $2\vec{a} + 3\vec{b}$
b. $|b|$
c. $\vec{a} \cdot \vec{b}$
d. $\vec{a} \times \vec{b}$
e. $\vec{b} \times \vec{a}$
f. A unit vector in the same direction as $\vec{b}$
g. $\text{comp}_{\vec{a}}\vec{b}$
h. $\text{proj}_{\vec{a}}\vec{b}$
i. The angle between $\vec{a}$ and $\vec{b}$

Problem 2. Find the area of the triangle formed by points $(1, 0, 0)$, $(2, 0, -1)$, and $(1, 4, 3)$.

Problem 3. Find parametric equations for the line that passes through $(1, 0, -1)$ and is parallel to the line $x = 4 - 3t$, $y = 2t$, $z = -2 + t$.

Problem 4. Find an equation of the plane that passes through $(1, 2, -2)$ and contains the line $x = 2t$, $y = 3 - t$, $z = 1 + 3t$.

Problem 5. Are the planes $x + y - z = 1$ and $2x - 3y + 4z = 5$ parallel? Why or why not?

Problem 6. Sketch the surface $x^2 + 4y^2 - z^2 = 4$. What is this surface called?