# After the exam of 12.09.2014: Typical errors, comments etc.

## Question 2

Fatal error (again):[1] "$\nabla f = 0$ at a point of local extremum of $f$ on $S_1(0)$".

Clarification: rather, $\nabla f = \lambda \nabla g$; $\lambda$ need not vanish.

Error: vague discussion of how the needed linear combination should result from the obtained equations.

Penalty: 13 points.

Clarification: You need to prove existence of numbers $\alpha, \beta, \gamma$ such that $x = \alpha a + \beta b + \gamma c$. No less, no more.

Error: the given linear independence of $a, b, c$ is not used (and so, the denominator could vanish).

Penalty: 7 points.

## Question 4

**Item (b)**

Comment: if $m \le f(\cdot) \le M$ on $[a, b]$ then

$$m \int_a^b \sin^2 nx \, \mathrm{d}x \le \int_a^b f(x) \sin^2 nx \, \mathrm{d}x \le M \int_a^b \sin^2 nx \, \mathrm{d}x \, .$$

However, $\int_a^b f(x) \cos 2nx \, \mathrm{d}x$ need not be sandwiched between $m \int_a^b \cos 2nx \, \mathrm{d}x$ and $M \int_a^b \cos 2nx \, \mathrm{d}x$.

**Item (c)**

Error: Pointwise convergence of the integrals $\int_0^1 f(r, \theta) \sin^2 nr \, r \, \mathrm{d}r$, treated as functions of $\theta$, does not imply convergence of their $\int_0^{2\pi} (\dots) \, \mathrm{d}\theta$.

Penalty: 7 points.

Comment: try $\int_0^1 \bigl( \int_0^{2\pi} f(r, \theta) \, \mathrm{d}\theta \bigr) \sin^2 nr \, r \, \mathrm{d}r$.

[1] It means, no points for this question!

## Grades statistics

| Total | Question 1 | Question 2 | Question 3 | Question 4 |
|---:|---:|---:|---:|---:|
| 103 | | 40 | 30 | 33 |
| 100 | 30 | 40 | 30 | |
| 100 | 30 | 40 | 30 | |
| 90 | | 40 | 30 | 20 |
| 73 | 10 | 33 | 30 | |
| 60 | 15 | 20 | 25 | |
| | | | | |
| 50 | 30 | 0 | | 20 |
| 46 | | 20 | 13 | 13 |
| 46 | | 15 | 18 | 13 |