



Bilkent University

Quiz # 5  
Math 102-Section 11  
28 April 2023, Friday, Moodle Quiz  
Instructor: Ali Sinan Sertöz  
**Solution Key**

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**Q-1)** Consider the function

$$f(x, y) = \sin(x + 23y) - e^{x-23y}.$$

- (a) Calculate  $f_x(x, y)$ .
- (b) Calculate  $f_{xx}(x, y)$ .
- (c) Calculate  $f_y(x, y)$ .
- (d) Calculate  $f_{yy}(x, y)$ .
- (e) Does there exist a constant  $c$  such that  $f_{xx}(x, y) + cf_{yy}(x, y) = 0$ ? If *yes* find this constant. If *no*, explain why.

Show your work in detail. Correct answers without detailed explanation do not get any credit.

Grading: 2+2+2+2+2=10 points.

**Solution:**

**(1-a)**  $f_x(x, y) = \cos(x + 23y) - e^{x-23y}.$

**(1-b)**  $f_{xx}(x, y) = -\sin(x + 23y) - e^{x-23y}.$

**(1-c)**  $f_y(x, y) = 23 \cos(x + 23y) + 23e^{x-23y}.$

**(1-d)**  $f_{yy}(x, y) = -529 \sin(x + 23y) - 529e^{x-23y}.$

**(1-e)**  $f_{xx}(x, y) + cf_{yy}(x, y) = -(1 + 529c)(\sin(x + 23y) + e^{x-23y}) = 0$  gives  $c = -1/529.$