

Homework questions for sections 15.5, 15.6

Math 114, Spring 2008

1. Suppose the temperature at the point (x, y) in the xy -plane is given by the formula

$$T(x, y) = \frac{1}{x^2 + 2y^2 + 2}.$$

Which of the following vectors points in the direction one should move from $(x_0, y_0) = (2, 1)$ in order to increase the temperature most rapidly?

- A) $\mathbf{u} = (-1, -1)$ B) $\mathbf{u} = (-1, 0)$ C) $\mathbf{u} = (-1, -2)$
D) $\mathbf{u} = (-2, -1)$ E) $\mathbf{u} = (0, -1)$ F) $\mathbf{u} = (0, -2)$

2. What is the directional derivative $D_{\mathbf{u}}f$ for the function $f(x, y) = 3x^2y$ at the point $(x_0, y_0) = (1, 1)$ in the direction $\mathbf{u} = (\frac{3}{5}, \frac{4}{5})$?
- A) 6 B) $\frac{31}{5}$ C) $\frac{32}{5}$ D) $\frac{33}{5}$ E) $\frac{34}{5}$ F) 7

3. Find the linearization of the function

$$f(x, y) = 3x^2 + 5xy - y^2$$

near the point $(x, y) = (1, 1)$.

A) $L(x, y) = 7 + 11(x - 1) + 3(y - 1)$

B) $L(x, y) = 7 + 12(x - 1) + 3(y - 1)$

C) $L(x, y) = 7 + 13(x - 1) + (y - 1)$

D) $L(x, y) = 7 + 9(x - 1) + 4(y - 1)$

E) $L(x, y) = 7 + 10(x - 1) + 3(y - 1)$

F) $L(x, y) = 7 + 11(x - 1) + 2(y - 1)$