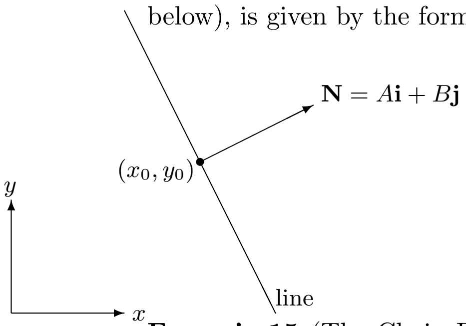
OKAN ÜNİVERSİTESİ
MÜHENDİSLİK-MİMARLIK FAKÜLTESİ
MÜHENDİSLİK TEMEL BİLİMLERİ BÖLÜMÜ

2014–15 **MAT233 Matematik III – Ödev 6** N. Course

SON TESLİM TARİHİ: Çarşamba 3 Aralık 2014 saat 10:00'e kadar.

**Egzersiz 14** (Dot Product). [25p] Suppose that $(x_0, y_0) \in \mathbb{R}^2$ is a point and that $\mathbf{N} = A\mathbf{i} + B\mathbf{j}$ is a vector ($A, B \in \mathbb{R}$). Show that the line through $(x_0, y_0)$, which is perpendicular to $\mathbf{N}$ (see diagram below), is given by the formula

$$A(x - x_0) + B(y - y_0) = 0.$$




**Egzersiz 15** (The Chain Rule). [25p] Suppose that $z = \tan^{-1}\left(\frac{x}{y}\right)$, $x = u\cos v$ and $y = u \sin v$. Use the chain rule ($\frac{\partial z}{\partial u} = \frac{\partial z}{\partial x}\frac{\partial x}{\partial u} + \frac{\partial z}{\partial y}\frac{\partial y}{\partial u}$, etc.) to show that

$$\frac{\partial z}{\partial u} = 0 \quad \text{and} \quad \frac{\partial z}{\partial v} = -1.$$

**Egzersiz 16** (Gradients). [25p] If $g : \mathbb{R}^2 \to \mathbb{R}$ is defined by

$$g(x, y) = \log(x^2 + y^2)$$

(where $\log = \ln = \log_e$ is the natural logarithm), calculate

$$\nabla g|_{(1,1)}\,.$$

**Egzersiz 17** (Directional Derivatives). [25p] Suppose that $h : \mathbb{R}^3 \to \mathbb{R}$ is defined by

$$h(x, y, z) = x^2 + 2y^2 - 3z^2.$$

Suppose that $P_0 = (1, 1, 1)$ and $\mathbf{v} = \mathbf{i} + \mathbf{j} + \mathbf{k}$, where $\mathbf{i} = (1, 0, 0)$, $\mathbf{j} = (0, 1, 0)$ and $\mathbf{k} = (0, 0, 1)$.

Calculate the derivative of $h$ at the point $P_0$ in the direction of $\mathbf{v}$.

[HINT: $\mathbf{v}$ is not a unit vector.]

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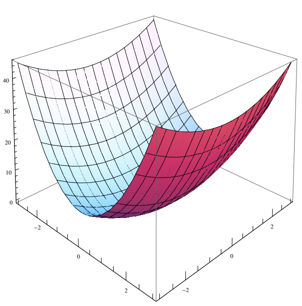
*Ödev 5'in çözümleri*

11. (a) Domain = all points in the xy-plane = $\mathbb{R}^2$. (b) Range: all real numbers $\mathbb{R}$. (c) level curves are straight lines $y - x = c$ parallel to the line $y = x$. (d) no boundary points. (e) both open and closed. (f) unbounded.

12. (a) Domain: set of all (x,y) so that $y - x \geq 0 \implies y \geq x$. (b) Range: $z \geq 0$. (c) level curves are straight lines of the form $y - x = c$ where $c \geq 0$. (d) boundary is $\sqrt{y - x} = 0 \implies y = x$, a straight line. (e) closed. (f) unbounded.

13. (a)  (b)