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Prodi : Pendidikan Fisika (A)

Problem 1.11

Find the gradion of the following function

a. $F(x,y,z) = x^2 + y^2 + z^4$

Jawab :

$\vec{\nabla} = 2x\hat{i} + 3y^2\hat{j} + 4z^5 t$

b. $t(x,y,z) = x^2 y^3 z^4$

$\vec{\nabla} = 2xy^3 z^4 \hat{i} + 3x^2 y^2 z^4 \hat{j} + 4x^2 y^3 z^4 \hat{k}$

c. $t(x,y,z) = e^x \sin(y) \ln(z)$

$= e^x \sin(y) \ln(z) \hat{i} + e^x \cos(y) \ln(z) \hat{i} + e^x \sin(y) \left(\frac{1}{z}\right) \hat{k}$

Problem 1.12

The height of a certain hill (cintill) is given by

$h(x,y) = 10(2xy - 3x^2 - 4y^2 - 18x + 28y + 12)$

where y is distance (in milis) noth. x the distance east of south Haddey.

a). Where is the top a the will locatd

b). How hight is the will

c). Low step is the slope (in feet per mili) at a pom 1 mile north and one mili eas or shouth Haddloy? In what direction is the slupe stepes, at that point

Jawab :

a. Dimanakah puncak bukti tersebut berada ?

$\vec{\nabla} b = 10[(2y - 6x - 18)\hat{i} + (2x - 8y + 28) j]$

Syarat

$\vec{\nabla} b = 0$ (puncak bukit merupakan jenis statiomer)

$\vec{\nabla} b = 10[(2y - 6x - 18)\hat{i} + (2x - 8y + 28) = 0$ menghasilkan sistem persamaan dua pilihan :

$2y - 6x - 18 = 0$ } Solusi dari persamaan

$2x - 8y + 28 = 0$ } $\ln = (x,y) = (12,3)$

Bantex

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b. Berapa ketinggian bukit tersebut

→ Subtituci $(x,y) = (-2,3)$ pada $b(x,y)$:

$b(-2,3) = 10(-12-12-36+36+0_4+12) = 720$ m

Jadi ketinggian 720 m

c. Subtitusi $(x,y) = (1,1)$ pada $\vec{\nabla} b$

$\vec{\nabla} b(1,1) = 10(2-6-18)i + (2-8+20)i = 220(i+j)$

$|\vec{\nabla} b| = 220\sqrt{2} = 311$ m/km

arahnya kebarat laut (135° dan sumbu x positif)

Problem 1.13

Letibe the separation Vektor from a fixed point (x', y', z') to the point (x, y, z) and let be its lenght show that

a) $\vec{\nabla}.(1) = 2n$

b) $\nabla(1/n) = -2/z^2$

c) What is the genaral formula for $v(z^v)$?

Jawab:

$(x, y, z)\ z = (x-x_0)i + (y-y_0)i + (zi - z_0)k$

$z = \sqrt{(x-x_0)^2 + (y-y_0)^2 + (z-z_0)^2}$

$(x_0, y_0, z_0)\ z = (x, x_0)^2 + (y-y_0)^2 + (z-z_0)^2$

a) $\vec{\nabla} z^2 = \frac{2}{2x}\left[(x-x_0)^2 + (y-y_0) + (z-z_0)\right]i + \frac{2}{2y}$

$\cdot\left[(x-x_0)^2 + (y-y_0)^2 + (z-z_0)\right]j + \frac{2}{2z}\left[(x-x_0) + (y-y_0) + (z-z_0)^2\right]k$

$= 2(x-x_0)i + 2(y.y_0)i + 2(z-z_0)k$

$= 2z$ (terbukti)

c). $\frac{2}{2x}(n^n) = n_2^{n-1} \cdot \frac{2n}{2x} = n_2^{n-1}\left(\frac{1}{2}\frac{1}{n} 2ax\right) = n_1^{n-1} \hat{n}x$, $(n_x = x - x_0)$

$\frac{2}{2y}(n^n) = n_2^n + \bar{n}y$, $\frac{2}{2z}(2n) = n_2^{n-1}\hat{n}z$; Sehingga $\vec{\nabla}(n^n) = n_n^{n-1}\hat{n}$.