Nama : Zahra Zahira Salsabila
NPM : 2013022041
Kelas : A

Ayo Berlatih

Problem 1.11
Find the gradien of the following functions.

a) $F(x,y,z) = x^2 + y^3 + z^4$

$\vec{\nabla} F = \frac{\partial f}{\partial x}\hat{x} + \frac{\partial f}{\partial y}\hat{y} + \frac{\partial f}{\partial z}\hat{z} = 2x\hat{x} + 3y^2\hat{y} + 4z^3\hat{z}$ /
$2x\,i + 3y^2 j + 4z^3 z^1$

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

$\nabla F = \frac{\partial f}{\partial x}\hat{x} + \frac{\partial f}{\partial y}\hat{y} + \frac{\partial f}{\partial z}\hat{z}$

$= \frac{\partial}{\partial x}(x^2y^3z^4)\hat{x} + \frac{\partial}{\partial y}(x^2y^3z^4)\hat{y} + \frac{\partial}{\partial z}(x^2y^3z^4)\hat{z}$

$= (2xy^3z^4)\hat{x} + (3x^2y^2z^4)\hat{y} + (4x^2y^3z^3)\hat{z}$

Problem (1.12)

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

$\nabla h = 0$ ada di ~~pusat~~ puncak

$2y - 6x - 18 = 0$
$2x - 8y + 28 = 0$
$2y - 6x - 18 = 0$
$6x - 24y + 84 = 0$
$-22y + 66 = 0$
$y = 3$

$2y - 6x - 18 = 0$
$2(3) - 6x - 18 = 0$
$-6x = 12$
$x = -2$

b) Substitusikan $x = -2, y = 3 \rightarrow h = 10(2/3)(-2) - 3(-2)^2 - 4(3)^2 - 18(-2) + 28(3) + (2)$

$h = 10(-12 - 12 - 36 + 36 + 84 + 12)$
$h = 720$ kali

c) Subs : $x = 1, y = 1$

$\nabla h = 10((2 - 6 - 18)\hat{x} + (2 - 8 + 28)\hat{y})$
$= 10(-22\hat{x} + 22\hat{y})$
$= 220(-\hat{x} + \hat{y})$
$|\nabla h| = 220\sqrt{2} = 311$ kali/mil

No.

Date :

3) Calculate the divergence of the follow Vector functions :

a) $\bar{V}(1) - 2\hat{i}$

$\mathcal{M} = (x - x')\hat{x} + (y - y')\hat{y}^2 + (z - z')\hat{z}^2$

$\mathcal{M} = \sqrt{(x - x')^2 + (y - y')^2 + (z - z')^2}$

$\nabla(\mathcal{M}^2) = \frac{2}{\partial x}\left((x - x')^2 + (y - y')^2 + (z - z')^2\right) + \frac{2}{\partial y}(x - x')^2 + (y - y')^2 + (z - z')^2$

$+ \frac{2}{\partial z}\left((x - x')^2 + (y - y')^2 + (z - z')^2\right)\hat{z}^2$

$= 2(x - x')\hat{x}^2 + 2(y - y')\hat{y}^2 + 2(z - z')\hat{z}^2 = 2$

Problem 1.14

$\bar{y} = y\cos\theta + z\sin\theta$

$\bar{y}\sin\theta = y\sin\theta\cos\theta + z\sin^2\theta$

$\bar{z} = -y\sin\theta + z\cos\theta$

$z\cos\theta - \bar{z}\sin\theta = y$

Sehingga

$\frac{\partial y}{\partial y} = \cos\theta, \frac{\partial z}{\partial z} = -\sin\theta; \frac{\partial z}{\partial y} = \sin\theta; \frac{\partial z}{\partial z} = \cos\theta$

$\overline{(\nabla F)y} = \frac{\partial f}{\partial y} = \frac{\partial f}{\partial y}\frac{\partial y}{\partial y} + \frac{\partial f}{\partial z}\frac{\partial z}{\partial y} = \cos\theta(\nabla F)y + \sin\theta(\nabla F)$

$\overline{(\nabla F)z} = \frac{\partial f}{\partial z} = \frac{\partial f}{\partial y} = \frac{\partial y}{\partial z} + \frac{\partial f}{\partial z}\frac{\partial z}{\partial z} = -\sin\theta(\nabla F)y + \cos\theta(\nabla F)$