Multivariable Calc 2

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December 17, 2018

1. shit
2. (a)

$$T(x,y,z) = x^2 + 2y^2 - 3z + 1$$
$$\Delta T = < 2x, 4y, -3 >$$
$$< \frac{2}{\sqrt{13}}, 0, -\frac{3}{\sqrt{13}} >$$

   (b)

$$T(3,2,1) = 15 \quad 17 = x^2 + y^2$$
$$T(\sqrt{15}, 1, 1) = 15$$
$$< \frac{3-\sqrt{15}}{\sqrt{1+(3-\sqrt{15})^2}}, \frac{1}{\sqrt{1+(3-\sqrt{15})^2}}, 0 >$$

3.

$$f(x,y) = e^{2x-y-2} + y + \sin(x-1) \quad x(t) = \cos(5t), y(t) = \sin(5t)$$
$$\frac{df}{dt} = \frac{\partial f}{\partial x}\frac{dx}{dt} + \frac{\partial f}{\partial y}\frac{dy}{dt}$$
$$\frac{\partial f}{\partial x} = 2e^{2x-y-2} + \cos(x-1) \quad \frac{dx}{dt} = -5\sin(t)$$
$$\frac{\partial f}{\partial y} = -e^{2x-y-2} + 1 \quad \frac{dy}{dt} = 5\cos(t)$$
$$\left(2e^{2x-y-2} + \cos(x-1)\right) \cdot -5\sin(t) + \left(-e^{2x-y-2} + 1\right) \cdot 5\cos(t) = \frac{df}{dt}$$

4.

$$f(x, y) = xy + x + 2y \quad g(x, y) = xy - 4$$

$$\Delta f =< y + 1, x + 2 > \quad \Delta g =< y, x >$$

$$\frac{y+1}{y} = \frac{x+2}{x} \to x = 2y$$

$$2y^2 = 4 \to y = \sqrt{2}, x = 2\sqrt{2}$$

5. s

6.

$$f : x^2 + y^2 + z^2 - 9 = 0 \quad g : z - x^2 - y^2 + 3 = 0$$

$$\Delta f =< 2x, 2y, 2z > \quad \Delta g =< -2x, -2y, 1 >$$

Tangent plane of f and g respectively: $4(x-2)-2(y+1)+4(z-2) = 0$

$$-4(x - 2) + 2(y + 1) + z - 2 = 0$$

$$\vec{n_1} =< 4, -2, 4 > \quad \vec{n_2} =< -4, 2, 1 >$$

$$\cos(\theta) = \frac{\vec{n_1} \cdot \vec{n_2}}{\| \vec{n_1} \| \cdot \| \vec{n_2} \|}$$

$$\cos(\theta) = \frac{-16}{6\sqrt{21}}$$