Wir 4: Sections 14.1, 14.3, 14.4

Section 14.1

Problem 1. Find and sketch the domain of the following functions.

a.) $f(x,y) = \sqrt{4x-2y}$

b.) $f(x,y) = \ln(y-3x)$

c.) $f(x,y) = \sqrt[4]{xy}$

d.) $f(x,y) = \dfrac{\sqrt{8-x^2-y^2}}{x+2y}$

e.) $f(x,y) = \dfrac{1}{\sqrt{x+2y}} + \sqrt{4-x^2-y^2}$

Problem 2. Sketch the graph of the following surfaces:

a.) $2z = x+3y-6$

b.) $z = x^2+6y^2$

c.) $z = y^2$

d.) $z = 7-x^2-2y^2$

Problem 3. Sketch several level curves for the following surfaces:

a.) $f(x,y) = 2+4x-y$

b.) $f(x,y) = x+y^2$

c.) $f(x,y) = \sqrt{9-x^2-y^2}$

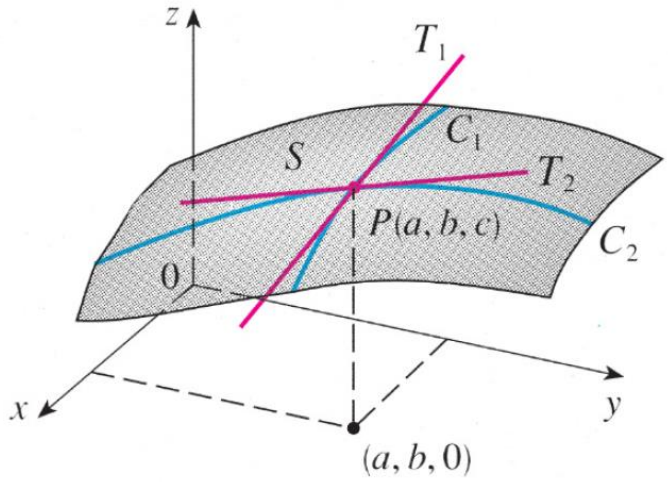
d.) $f(x,y) = 8\sqrt{x^2-y^2}$

Problem 4. Describe the level surfaces of $f(x,y,z) = x+y+z$.

Problem 5. Describe the level surfaces of $f(x,y,z) = x^2+y^2+z^2$.

Thanks to Amy Austin for generously sharing all of her WIR problems from last semester.

Section 14.3



Problem 6. Find $f_x(-1, 2)$ and $f_y(-1, 2)$ for $f(x, y) = x^3 - y^4 - 6x^2y^3$

Problem 7. Find $f_x(x, y)$ and $f_y(x, y)$ for $f(x, y) = x^2 e^{\cos(2x^4y^2)}$

Problem 8. If $f(x, y) = ye^{-x} + 2x$, find $\left.\frac{\partial f}{\partial x}\right|_{(1,0)}$ and $\left.\frac{\partial f}{\partial y}\right|_{(1,0)}$

Problem 9. Find all higher order partial derivatives for $f(x, y) = \ln(2x + 3y)$

Section 14.4

Problem 10. Find the differential of $z = x^2 + 2y^2 + 4xy$ at the point (1, 2).

Problem 11. Find the differential of $f(x, y, z) = x^2y^3z^4$.

Problem 12. Find an equation of the tangent plane to the surface $z = x^3 - 3y^2$ at point $(-1, 1)$.

Problem 13. Find an equation of the tangent plane to the surface $z = e^{x-y}$ at point $(2, 2, 1)$. What is the equation of the normal line to this tangent plane at point $(2, 2, 1)$?

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Problem 14. Using the tangent plane to the graph of $f(x,y) = \sqrt{24 - x^2 - y^2}$ at point $(2, 2)$, approximate $f(2.09, 1.93)$.

Problem 15. Use differentials to approximate $((1.97)^3 - 2(0.9)^4 + 4(1.01)^5)^3$.

Problem 16. The length and width of a rectangle are measured as 30 cm and 24 cm, respectively, with an error in measurement of 0.1 cm in both. Use differentials to approximate the maximum error in the calculated area of the rectangle.

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