



KURS FUNKCJE WIELU ZMIENNYCH

Lekcja 1
Pochodne cząstkowe

Odpowiedzi do zadania domowego

Część 1: TEST

- 1) c
- 2) a
- 3) a
- 4) c
- 5) d
- 6) c
- 7) a
- 8) c
- 9) b
- 10) a

ODPOWIEDZI DO ZADAŃ

Zad. 1

$$1) \quad \frac{\partial z}{\partial x} = 2x \quad \frac{\partial z}{\partial y} = 3y^2$$

$$2) \quad \frac{\partial z}{\partial x} = 12x^3y - 2x \quad \frac{\partial z}{\partial y} = 10y + 3x^4$$

$$3) \quad \frac{\partial z}{\partial x} = \frac{-2y}{(x-y)^2} \quad \frac{\partial z}{\partial y} = \frac{2x}{(x-y)^2}$$

$$4) \quad \frac{\partial z}{\partial x} = y \cos x \quad \frac{\partial z}{\partial y} = \sin x$$

$$5) \quad \frac{\partial z}{\partial x} = xy + 2xy \ln x \quad \frac{\partial z}{\partial y} = x^2 \ln x$$

$$6) \quad \frac{\partial z}{\partial x} = \frac{1}{x-2y^2} \quad \frac{\partial z}{\partial y} = \frac{-4y}{x-2y^2}$$

$$7) \quad \frac{\partial z}{\partial x} = \frac{1}{y\sqrt{1-\left(\frac{x}{y}\right)^2}} \quad \frac{\partial z}{\partial y} = \frac{-x}{y^2\sqrt{1-\left(\frac{x}{y}\right)^2}}$$

$$8) \quad \frac{\partial z}{\partial x} = -\frac{(1+2y)\sin(\ln(x+2xy))}{x+2xy} \quad \frac{\partial z}{\partial y} = -\frac{2x\sin(\ln(x+2xy))}{x+2xy}$$

- 9) $\frac{\partial z}{\partial x} = 45x^2 y (5x^3 y + 5)^2$ $\frac{\partial z}{\partial y} = 15x^3 (5x^3 y + 5)^2$
- 10) $\frac{\partial z}{\partial x} = e^{(4x+8y)\ln(4x+8y)} (4\ln(4x+8y) + 4)$ $\frac{\partial z}{\partial y} = e^{(4x+8y)\ln(4x+8y)} (8\ln(4x+8y) + 8)$
- 11) $\frac{\partial u}{\partial x} = y + yz + 3$ $\frac{\partial u}{\partial y} = xz + z + x$ $\frac{\partial u}{\partial z} = xy + y$
- 12) $\frac{\partial u}{\partial x} = \frac{x}{\sqrt{x^2 + 3y^2 - z}}$ $\frac{\partial u}{\partial y} = \frac{3y}{\sqrt{x^2 + 3y^2 - z}}$ $\frac{\partial u}{\partial z} = -\frac{1}{2\sqrt{x^2 + 3y^2 - z}}$
- 13) $\frac{\partial u}{\partial x} = 2xe^{x^2+y^2+z^2}$ $\frac{\partial u}{\partial y} = 2ye^{x^2+y^2+z^2}$ $\frac{\partial u}{\partial z} = 2ze^{x^2+y^2+z^2}$
- 14) $\frac{\partial u}{\partial x} = yz^{xy} \ln z$ $\frac{\partial u}{\partial y} = xz^{xy} \ln z$ $\frac{\partial u}{\partial z} = xyz^{xy-1}$
- 15) $\frac{\partial u}{\partial x} = 2\sin(x + yz)\cos(x + yz)$ $\frac{\partial u}{\partial y} = 2z\sin(x + yz)\cos(x + yz)$
 $\frac{\partial u}{\partial z} = 2y\sin(x + yz)\cos(x + yz)$

Zad. 2

- 1) $\frac{\partial^2 z}{\partial x \partial x} = 6$ $\frac{\partial^2 z}{\partial y \partial x} = -1$
 $\frac{\partial^2 z}{\partial x \partial y} = -1$ $\frac{\partial^2 z}{\partial y \partial y} = 2$
- 2) $\frac{\partial^2 z}{\partial x \partial x} = -\frac{2xy^3}{((xy)^2 + 1)^2}$ $\frac{\partial^2 z}{\partial y \partial x} = \frac{1 - x^2 y^2}{((xy)^2 + 1)^2}$
 $\frac{\partial^2 z}{\partial x \partial y} = \frac{1 - x^2 y^2}{((xy)^2 + 1)^2}$ $\frac{\partial^2 z}{\partial y \partial y} = -\frac{2x^3 y}{((xy)^2 + 1)^2}$
- 3) $\frac{\partial^2 z}{\partial x \partial x} = e^{e^x y} (e^x y)^2 + e^{e^x y} e^x y$ $\frac{\partial^2 z}{\partial y \partial x} = e^{e^x y} (e^x)^2 y + e^{e^x y} e^x$
 $\frac{\partial^2 z}{\partial x \partial y} = e^{e^x y} (e^x)^2 y + e^{e^x y} e^x$ $\frac{\partial^2 z}{\partial y \partial y} = e^{e^x y} (e^x)^2$
- 4) $\frac{\partial^2 z}{\partial x \partial x} = \ln y (\ln y - 1) x^{\ln y - 2}$ $\frac{\partial^2 z}{\partial y \partial x} = \frac{x^{\ln y - 1} \ln x \ln y}{y} + \frac{x^{\ln y - 1}}{y}$
 $\frac{\partial^2 z}{\partial x \partial y} = \frac{x^{\ln y - 1} \ln x \ln y}{y} + \frac{x^{\ln y - 1}}{y}$ $\frac{\partial^2 z}{\partial y \partial y} = \frac{x^{\ln y} \ln^2 x}{y^2} - \frac{x^{\ln y} \ln x}{y^2}$



$$\frac{\partial^2 u}{\partial x \partial x} = 2y + 6x \quad \frac{\partial^2 z}{\partial y \partial x} = 2x - 5z \quad \frac{\partial^2 z}{\partial z \partial x} = -5y$$

$$5) \quad \frac{\partial^2 z}{\partial x \partial y} = 2x - 5z \quad \frac{\partial^2 z}{\partial y \partial y} = 0 \quad \frac{\partial^2 z}{\partial z \partial y} = -5x$$

$$\frac{\partial^2 z}{\partial x \partial z} = -5y \quad \frac{\partial^2 z}{\partial y \partial z} = -5x \quad \frac{\partial^2 z}{\partial z \partial z} = 6z$$

Zad.3

- 1) 12
- 2) $2e^{x^2yz} x^5 y^2 z^2 + 6e^{x^2yz} x^3 yz + 2e^{x^2yz} x$
- 3) $1440x^3 y^2 z$

Zad.4

- 1) Spełnia
- 2) Spełnia
- 3) Nie spełnia
- 4) Spełnia
- 5) Spełnia

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