Dear Students,

I ask you to complete the individual task below on the topic "Differential calculus of functions of many variables." Send, please, the completed task to my email address **until April 10, 2020.: kurpalidia@gmail.com**

This topic will be estimated based on the results of this assignment

If you have any questions, then you can ask me also through my E-mail

Individual task to topic” Differential calculus for function with several variables”

Task 1.

2.1.1. Show that the function $u = \sin x + (\sin y - \sin x)^2$, satisfies the following equation

$$\frac{\partial u}{\partial y}\cos x + \frac{\partial u}{\partial x}\cos y = \cos x \cos y$$

2.1.2. Show that the function $z = \frac{y}{(x^2 - y^2)}$. satisfies the following equation

$$\frac{1}{x}\frac{\partial z}{\partial x} + \frac{1}{y}\frac{\partial z}{\partial y} = \frac{z}{y^2}$$

2.1.3. Show that the function $z = y + \left(x^2 - y^2\right)$ satisfies the following equation

$$y\frac{\partial z}{\partial x} + x\frac{\partial z}{\partial y} = x$$

2.1.4. Show that the function $z = xy + x\cos\frac{y}{x}$ satisfies the following equation

$$x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} = z + xy$$

2.1.5. Show that the function $z = y\left(x^2 - y^2\right) + x\cos\frac{y}{x}$ satisfies the following equation

$$\frac{1}{x}\frac{\partial z}{\partial x} + \frac{1}{y}\frac{\partial z}{\partial y} = \frac{z}{y^2}$$

2.1.6. Show that the function $z = 2xy$ satisfies the following equat**ion**

$$\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial y^2}=0$$

2.1.7. Show that the function $z=x^2-y^2$ satisfies the following equation

$\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial y^2}=0$

2.1.8. Show that the function $z=2xy$ satisfies the following equa**tion**

$$\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial y^2}=0$$

2.1.9. Show that the function $z=x^3-3xy^2$ satisfies the following equa**tion**

$$\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial y^2}=0$$

2.1.10. Show that the function $z=3x^2y-y^3$ satisfies the following equa**tion**

$$\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial y^2}=0$$

2.1.11. Show that the function $z=\ln\left(x^2+y^2+5\right)$ satisfies the following equa**tion**

$$\frac{\partial^2 z}{\partial x\partial y}=-\frac{4xy}{\left(x^2+y^2+5\right)^2}$$

2.1.12. Show that the function $z=\arcsin\frac{x}{y}$ satisfies the following equation

$$\frac{x}{y^2}\frac{\partial z}{\partial x}+\frac{\partial z}{\partial y}=0$$

2.1.13. $z=x+y+\cos(x/y)$. Prove that $x\frac{\partial z}{\partial x}+y\frac{\partial z}{\partial y}=x+y.$

2.1.14. $z=\frac{1}{2}\left(x^2+y^2\right)+(x-y)$. Prove that $\frac{\partial z}{\partial x}+\frac{\partial z}{\partial y}=x+y.$

2.1.15. $z=xe^{\frac{x}{y}}-x^2-y^2$. Prove that $x\frac{\partial z}{\partial x}+y\frac{\partial z}{\partial y}=z-x^2-y^2.$

2.1.16. $z=y\cos(x^2-y^2)$. Prove that $y^2\frac{\partial z}{\partial x}+xy\frac{\partial z}{\partial y}=xz.$

2.1.17. $z=x\ln\left(\frac{y}{x^2}\right)$. Prove that $x\frac{\partial z}{\partial x}+2y\frac{\partial z}{\partial y}=z.$

2.1.18. $z=\frac{y^2}{3x}+2xy$. Prove that $x^2\frac{\partial z}{\partial x}-xy\frac{\partial z}{\partial y}+y^2=0.$

2.1.19. $z = y\cos(x-y)$. Prove that $\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = \frac{x}{y}$.

2.1.20. $z = x^2 \ln y$, where $x = \frac{u}{v}, y = 3u - 2v$. Find $\frac{\partial z}{\partial u}, \frac{\partial z}{\partial v}$.

2.1.21. $z = \frac{x+y}{(x^2 - y^2)}$. Prove that $y\frac{\partial z}{\partial x} + x\frac{\partial z}{\partial y} = z$.

2.1.22. $u = \frac{yz}{x}$, where $x = e^t, y = \ln t, z = t^2 - 1$. Find $\frac{dz}{dt}$.

2.1.23. $z = \arctan(xy)$, where $y = e^x$. Find $\frac{dz}{dx}$.

2.1.24. $u = \arcsin\frac{x}{z}$, where $z = \sqrt{x^2+1}$. Find $\frac{\partial u}{\partial x}$ and $\frac{du}{dx}$.

2.1.25. $z = arctg\frac{y}{x}$, where $x = e^{2t+1}, y = e^{2t-1}$. Find $\frac{dz}{dt}$.

2.1.26. $u = xyz$, where $x = t^2 + 1$, $y = \ln t$, $z = \tan t$. Find $\frac{du}{dt}$.

2.1.27. $u = \frac{z}{\sqrt{x^2+y^2}}$, where $x = R\cos t$, $y = R\sin t$, $z = H$. Find $\frac{du}{dt}$.

2.1.28. $z = \ln\sin\frac{x}{\sqrt{y}}$, where $x = 3t^2, y = \sqrt{t^2+1}$. Find $\frac{dz}{dt}$.

2.1.29. $z = \ln\left(x^2 + y^2\right)$, where $y = \frac{1}{3}x^3 + x$. Find $\frac{\partial z}{\partial x}$ and $\frac{dz}{dx}$.

2.1.30. $z = \arctan\frac{x+y}{1-xy}$, where $y = \cos x$. Find $\frac{dz}{dx}$.

Task 2.

Investigate the following functions for an extreme:

2.2.1. $z = x^3y^2(6 - x - y)$;

2.2.2. $z = x^2 + xy + y^2 + \frac{1}{x} + \frac{1}{y}$;

2.2.3. $z = \sin x + \sin y + \sin(x+y)$, $(0 \le x \le \pi/2,\ 0 \le y \le \pi/2)$;

2.2.4. $z = \sin x \sin y \sin(x+y)$, $(0 \le x \le \pi,\ 0 \le y \le \pi)$;

2.2.5. $z = x^2 + xy + y^2 - 2x - y$;

2.2.6. $z = e^{-x^2-y^2}(2x^2 + y^2)$;

2.2.7. $z=x^4+y^4-2x^2+4xy-2y^2$;

2.2.8. $z=1+6x-x^2-xy-y^2$;

2.2.9. $z=x^2-xy+y^2-2x+y$;

2.2.10. $z=x^3-3xy+y^3$;

2.2.11. $z=3x^2-x^3+3y^2+4y$;

2.2.12. $z=xy+\frac{50}{x}+\frac{20}{y}\quad(x>0,\ y>0)$;

2.2.13. $z=e^{2x+3y}(8x^2-6xy+3y^2)$;

2.2.14. $z=e^{x^2-y}(5-2x+y)$;

2.2.15. $z=(5x+7y-25)e^{-\left(x^2+xy+y^2\right)}$;

2.2.16. $z=x^2+xy+y^2-4\ln x-10\ln y$;

2.2.17. $z=\sin x+\cos y+\cos(x-y), (0\le x\le \pi/2, 0\le y\le \pi/2)$;

2.2.18. $z=x-2y+ln\sqrt{x^2+y^2}+3arctan\, y/x$;

2.2.19. $z=xy\,ln(x^2+y^2)$;

2.6.20. $z=xy\sqrt{1-\frac{x^2}{a^2}-\frac{y^2}{b^2}}, (a>0, b>0)$;

2.2.21. $z=x^2+y^2-2\,ln\,x-18\,ln\,y, \left(x>0,\ y>0\right)$;

2.2.22. $z=x^3+3xy^2-15x-12y$;

2.2.23. $z=2x^3+2y^3-36xy+430$;

2.2.24. $z=x^2+xy+y^2-2x-y$;

2.2.25. $z=3x^2-x^3+3y^2+4y$

2.2.26. $z=e^{-x^2-y^2}(2x^2+y^2)$;

2.2.27. $z=x^4+y^4-2x^2+4xy-2y^2$;

2.2.28. $z=x^3-3xy+y^3$;

2.2.29. $z=3x^2-x^3+3y^2+4y$;

2.2.30. $z=e^{x^2-y}(5-2x+y)$

Task 3.

Find the greatest and the smallest values of the function $z = f(x,y)$ **in domain D, bounded by the given curves**

2.3.1. $z = xy$, D: $x + y = 1; x = 0; \quad y = 0$

2.3.2. $z = x + y$, D: $x^2 + y^2 = 1; \ x \geq 0; \quad y \geq 0$

2.3.3. $z = x^2 + y^2$, D : if $\frac{x}{2} + \frac{y}{3} = 1; \ x \geq 0; \quad y \geq 0$

2.3.4. $z = cos^2 x + cos^2 y$, D: $x - y = \pi / 4; x \leq 0; \quad y \leq 0$

2.3.5. $z = x^2 + y^2 - 2y - 2x - 8$, D: $x + y = 1; x = 0; \quad y = 0$;

2.3.6. $z = x + 2y$, D: $x^2 + y^2 = 5; \ x \geq 0; \quad y \geq 0$

2.3.7. $z = \frac{1}{x} + \frac{1}{y}$, D: $x + y = 2; \ x \geq 1; \quad y = 1$

2.3.8. $z = xy^2$, D: $x + 2y = 1; \ x \geq 0; \quad y \geq 0$

2.3.9. $z = x^2 + y^2 - xy + x + y - 4$, D: $x + y + 3 = 0; \ x = 1; \quad y \geq 0$

2.3.10. $z = \frac{x - y - 4}{\sqrt{2}}$, D: $x^2 + y^2 = 1; \quad x \geq 0; \quad y \geq 0$

2.3.11. $z = x^2 + 2xy - y^2 - 4x$, D: $x - y - 1, x = 3, \quad y = 0$;

2.3.12. $z = 2x + y$, D: $x^2 + y^2 = 1; \ x \geq 0; \quad y \geq 0$

2.3.13. $z = 2x + 5y$, D: $x^2 + y^2 = 1; \ x \geq 0; \quad y \geq 0$

2.3.14. $z = 2x^2 + 2y^2$, D : if $\frac{x}{2} + \frac{y}{3} = 1; \ x \geq 0; \quad y \geq 0$

2.3.15. $z = x^2 + y^2 - 2y - 2x - 8$, D: $x + y = 2; x = 1; \quad y = 1$;

2.3.16. $z = x + 2y$, D: $x^2 + y^2 = 25; \ x \geq 0; \quad y \geq 0$

2.3.17. $z = x^3 + 8y^3 - 6xy + 25$, D: $y = x, \quad y = 0; \quad x = 2$;

2.3.18. $z = xy - x - 2y$,, D: $x = 3; \quad y = x; \quad y = 0$;

2.3.19. $z = 2x^3 - xy^2 + y^2$,, D: $x = 0; x = 1; \quad y = 6; \quad y = 0$;

2.3.20. $z = 3x^2 + 3y^2 - 2x - 2y + 2$,, D: $x = 0; y = 0; x = y - 1 = 0$;

2.3.21. $z = xy$, D: $x + y = 1; x = 0; \quad y = 0$

2.3.22. $z = x + y$, D: $x^2 + y^2 = 1$; $x \ge 0$; $y \ge 0$

2.3.23. $z = x^2 + y^2$, D : if $\frac{x}{2} + \frac{y}{3} = 1$; $x \ge 0$; $y \ge 0$

2.3.24. $z = cos^2 x + cos^2 y$, D: $x - y = \pi / 4$; $x \le 0$; $y \le 0$

2.3.25. $z = x^2 + y^2 - 2y - 2x - 8$, D: $x + y = 1$; $x = 0$; $y = 0$;

Task 4.

2.4.1. Write equations of a tangent line and a normal plane for the given curves at the given point $x = t - sin t$, $y = t - cos t$, $z = 4 sin t / 2$ at $t = \pi / 2$;

2.4.2. On the curve $x = cos t$, $y = sin t$, $z = e^t$ find the point, at which the tangent line is parallel to the plane $\sqrt{3}\, x + y - 4 = 0$.

2.4.3. On the curve $x = \frac{t^4}{4}$, $y = \frac{t^3}{3}$, $z = \frac{t^2}{2}$ find the points at which the tangent to this curve is parallel to the plane $x + 3y + 2z - 10 = 0$.

For the given surfaces 2.4.4–2.4.11 find the equations of the tangent planes and normal line at the given points:

2.4.4. $x^2 + y^2 + z^2 = 16z$ at the point $(8\cos\alpha, 8\sin\alpha, 8)$;

2.4.5. $2^{x/z} + 2^{y/z} = 8$ at the point $(2, 2, 1)$;

2.4.6. $x^2 yz + 2x^2 z - 3xyz + 2 = 0$ at the point $(1, 0, -1)$;

2.4.7. $z = e^{x cos y}$ at the point $(1, \pi, 1/e)$;

2.4.8. $4 + \sqrt{x^2 + y^2 + z^2} = x + y + z$ at the point $(2, 3, 6)$;

2.4.9. $z = arctan \frac{y}{x}$ at the point $(1, 1, \pi / 4)$;

2.4.10. $z = \frac{x^3 - 6xy + y^3}{4}$ at the point $(2, 2, -2)$.

2.4.11. $z^2 + 4z + x^2 = 0$ at the points of intersection with the axis OZ.

2.4.12. For the surface $x^2 - z^2 - 2x + 6y = 4$ find the equation of the normal parallel to the straight line $\frac{x+2}{1} = \frac{y}{3} = \frac{z+1}{4}$.

2.4.13. For the surface $z = 4x - xy + y^2$ find the equation of the tangent plane, parallel to the plane $4x + y + z - 2z + 9 = 0$.

2.4.14. Find the tangent planes to the surface $x^2 + 2y^2 + 3z^2 = 21$ parallel to the plane $x + 4y + 6z = 0$.

2.4.15. On the surface $x^2 + y^2 - z^2 - 2x$ find the points at which the tangent planes are parallel to the coordinate planes.

2.4.16. Define the tangent plane to the surface $x^2 + 4y^2 + z^2 = 36$ parallel to the plane $x + y - z = 0$.

2.4.17. Find at which point the tangent plane to the surface $z = 4 - x^2 - y^2$ is parallel to the plane $2x + 2y + z = 0$. Find the equation of this tangent plane.

2.4.18. Find the tangent plane to the surface $x^2 - y^2 - 3z = 0$ passing through the point $A(0,\ 0,\ -1)$ parallel to the curve $\frac{x}{2} = y = \frac{z}{2}$.

2.4.19. On the surface $x^2 + y^2 + z^2 - 6y + 4z = 12$ find the point, at which the tangent planes are parallel to the coordinate planes.

2.4.20. For the surface $z = xy$ find the equation of the tangent plane perpendicular to the straight line $\frac{x+2}{2} = \frac{y+2}{2} = \frac{z-1}{-1}$.

2.4.21. Write equations of a tangent line and a normal plane for the given curves at the given point $x = t - \sin t$, $y = t - \cos t$, $z = 4\sin t/2$ at $t = \pi/2$;

2.4.22. On the curve $x = \cos t$, $y = \sin t$, $z = e^t$ find the point, at which the tangent line is parallel to the plane $\sqrt{3}\,x + y - 4 = 0$.

2.4.23. On the curve $x = \frac{t^4}{4}$, $y = \frac{t^3}{3}$, $z = \frac{t^2}{2}$ find the points at which the tangent to this curve is parallel to the plane $x + 3y + 2z - 10 = 0$.

2.4.24. For the surface $x^2 - z^2 - 2x + 6y = 4$ find the equation of the normal parallel to the straight line $\frac{x+2}{1} = \frac{y}{3} = \frac{z+1}{4}$.

2.4.25. For the surface $z = 4x - xy + y^2$ find the equation of the tangent plane, parallel to the plane $4x + y + z - 2z + 9 = 0$.

2.4.26. Find the tangent planes to the surface $x^2 + 2y^2 + 3z^2 = 21$ parallel to the plane $x + 4y + 6z = 0$.

2.4.27. On the surface $x^2+y^2-z^2-2x$ find the points at which the tangent planes are parallel to the coordinate planes.

2.4.28. Define the tangent plane to the surface $x^2+4y^2+z^2=36$ parallel to the plane $x+y-z=0$.

2.4.29. For the given surfaces $2^{x/z}+2^{y/z}=8$ find the equations of the tangent planes and normal line at the point $(2,\ 2,\ 1)$;

2.4.30. For the given surfaces $x^2yz+2x^2z-3xyz+2=0$ find the equations of the tangent planes and normal line at the point $(1,\ 0,\ -1)$;

Task 5.

Find the gradient of the functionx $u=F(x,y,z)$ **at the point** $A(x_0,y_0,z_0)$**:**

2.5.1. $u=-x^2+y^2+z^2-6y+4z-12$, A(2,8,0);

2.5.2. $u=x^2-y^2-3z$, A(-3,0,3);

2.5.3. $u=x^2+y^2-3z^2+2y$, A(0,-3,1);

2.5.4. $u=5x^2+2y^2-3z^2+2y$, A(0,-3,1);

2.5.5. $u=x^2-y^2+z$, A(1,2,5);

2.5.6. $u=\frac{x^2}{16}+\frac{y^2}{9}-\frac{z^2}{8}$, A(4,3,4);

2.5.7 $u=4x^2-2y^2+3z^3+2y$, A(1,2,0);

2.5.8. $u=3xyz-z^3$, A(0,2,-2);

2.5.9. $u=z-\frac{x^2}{2}+y^2$, A(2,-1,1);

2.5.10. $u=z-x^2-y^2-xy-x+y-1$, A(2,-2,9);

2.5.11. $u=z-x^3-y^3+3xy$, A(1,1,-1);

2.5.12; $u=4x^2-y^2+z^2-16$, A(-2,1,-1);

2.5.13. $u=x^2-2y^2+2z^2-1$, A(1,-1,1);

2.5.14. $u = x^2 + 2y^2 - 2z^2 - 1$, A(-1,1,-1);

2.5.15. $u = 4x^2 - y^2 + z^2 - 16$, A(-2,1,-1);

2.5.16. $u = x^2 + y^2 - 4z^2$, A(2,-2,-$\sqrt{2}$);

2.5.17. $u = x^2 - y^2 + z^2 - 4$, A(1,1,-2);

2.5.18. $u = x^2 + y^2 + z - 4$, A(-1,-1,2);

2.5.19. $u = x^2 - y^2 - z^2$, A(-2,1,$-\sqrt{3}$);

2.5.20. $u = -x^2 + 4y^2 - z^2 - 4$, A(-2,-2,4);

2.5.21. $u = x^2 + 9y^2 - 6x + z^2 - 4z + 4$, A(3,-1,2);

2.5.22. $u = x^2 + y^2 - 2z - 10$, A(2,2,-1);

2.5.23. $u = x^2 + 4y^2 - z^2 - 4$, A(0,-1,0);

2.5.24. $u = x^2 + y^2 - 4z - 9$, A(2,-1,-1);

2.5.25. $u = x^2 - y^2 - z^2$, A(-3,2,-$\sqrt{5}$);

2.5.26. $u = x^2 - y^2 - z^2 + 6y - 4z + 12$, A(2,8,0);

2.5.27. $u = x^2 - y^2 - 3z$, A(-3,0,3);

2.5.28. $u = x^2 + y^2 - 3z^2 - 2y$, A(0,3,1);

2.5.29. $u = x^2 + y^2 - z$, A(-1,2,5);

2.5.30. $u = \dfrac{x^2}{16} - \dfrac{y^2}{3} + \dfrac{z^2}{8}$, A(4,3,4).

Task 6

Find the derivative of the function $\varphi(x, y, z)$ with respect to the given direction:

2.6.1. $\varphi = xyz$ with respect to the direction $\overrightarrow{AB}$, where A(1,-1,1), B(2,3,1);

2.6.2. $\varphi = \left(x^2 + y^2 + z^2\right)^{3/2}$ at the point A(1,1,1) with respect to $\vec{\ell} = 2\vec{j} - \vec{k}$;

2.6.3. $\varphi = arctg(xy)$ at the point A(1,1) with respect to the direction of the bisector of the first coordinate angle;

2.6.4. $\varphi = \ln\left(e^x + e^y\right)$ at the point A(0,0) with respect to the direction of a ray forming the angle $\pi/6$ with the axis OX;

2.6.5. $\varphi = ln(xy + yz + xz)$ at the point A(0,1,1) of the circle $\begin{cases} x = cos\,t \\ y = sin\,t \\ z = 1 \end{cases}$ with respect to the direction of this circle.

2.6.6. $\varphi = arctg\frac{x}{y}$ at the point $A\left(1,-\sqrt{3}\right)$ of the circle $x^2 + y^2 = 4x$ with respect to the direction of this circle;

2.6.7. $\varphi = x^2 + y^2$ at the point A(-1,1) of the circle $x^2 + y^2 = 2$ with respect to the direction of this circle;

2.6.8. $\varphi = xz^2 + 2yz$ at the point A(1,0,2) of the circle $\begin{cases} x^2 + y^2 - 2x + 2y + 1 = 0 \\ z = 6 \end{cases}$ with respect to the direction of this circle;

2.6.9. $\varphi = ln(x^2 + 2y)$ at the point A(4,-4) of the parabola $y^2 = 4x$ with respect to the direction of this curve;

2.6.10. $\varphi = y^2 + 2yx$ at the point A(0,-2) of the ellipse $x^2 + \frac{y^2}{4} = 1$ with respect to the direction of this curve;

2.6.11. $\varphi = \frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2}$ at the point $A\left(x_0, y_0, z_0\right)$ with respect to the direction of the radius-vector of this point;

2.6.12. $\varphi = ln\left(x^2 + 4xy + 3y^2\right)$ at the point A(2,0) with respect to the direction of the vector collinear to the bisector of the 1st coordinate angle;

2.6.13. $\varphi = 3xz - \frac{z}{x}$ at the point A(-1,2,3) with respect to the direction of $\vec{\ell} = \vec{i} - \vec{j} + \sqrt{2}\vec{k}$;

2.6.14. $\varphi = \sqrt{xy} + \sqrt{4 - z^2}$ at the point A(-1,-1,0) with respect to the direction of $\vec{\ell} = 2\vec{i} - 2\vec{j} + \vec{k}$;

2.6.15. $\varphi = x^3 + \sqrt{4y^2 + z^2}$ at the point A(-2,2,-3) with respect to the direction of $\vec{\ell} = -3\vec{i} + 4\vec{k}$;

2.4.16. $\varphi = 2\sqrt{y - z} + y\,arctg\,x$ at the point A(1,4,-5) with respect to the direction of $\vec{\ell} = 4\vec{i} - 3\vec{j}$;

2.6.17. $\varphi = 2x^2 - ln\left(z^2 + y^2\right)$ at the point A(2,-1,1) with respect to the direction of $\vec{\ell} = \{0;-1;0\}$;

2.6.18. $\varphi = cos(x - 2y) + 4yz^2$ at the point $A\left(\pi/2, \pi/4, 1\right)$ with respect to the direction of $\vec{\ell} = \{2;-1;2\}$;

2.6.19. $\varphi = y^2 + arctg(x - z)$ at the point A(0,-2,-1) with respect to the direction of $\vec{\ell} = \{2;-6;-3\}$;

2.6.20. $\varphi = xy^2 + \sqrt{yx^2 - z^3}$ at the point A(-1,1,-2) with respect to the direction of $\vec{\ell} = 8\vec{i} - 4\vec{j} - 8\vec{k}$;

2.6.21. $\varphi = x^2 y^2 z + ln(z+1)$ at the point A(4,-3,0) with respect to the direction of $\vec{\ell} = 2\vec{i} + \vec{k}$;

2.6.22. $\varphi = yz + \frac{z}{x}$ at the point A(-1,3,4) with respect to the direction of $\vec{\ell} = \vec{i} - \vec{k}$;

2.6.23. $\varphi = \sqrt{xy} + \sqrt{yz} + \sqrt{xz}$ at the point A(-1,-1,-1) with respect to the direction of $\vec{\ell} = \vec{i} + \vec{j} + \vec{k}$;

2.6.24. $\varphi = 3\sqrt{x - y} + 2\sqrt{z - x}$ at the point A(1,-3,5) with respect to the direction of $\vec{\ell} = -\vec{i} + 2\vec{k}$;

2.6.25. $\varphi = x^2 - 5arcctg(y + 2z)$ at the point A(1,1,0) with respect to the direction of $\vec{\ell} = 2\vec{i} + \vec{j} - 2\vec{k}$.

2.6.26. $\varphi = x^2 + y^2 - 3x + 2y$ with respect to the direction of the vector $\overrightarrow{AB}$, where A(0,0,0), B(3,4,0);

2.6.27. $\varphi = x^2 z - 2xyz + z^2$ at the point A(3,1,1) with respect to the direction of $\vec{\ell} = \vec{i} + \sqrt{2}\vec{j} + \vec{k}$;

2.6.28. $\varphi = xyz$ at the point A(5,1,-8) with respect to the direction to this point from the point B(9,4,4);

2.6.29. $\varphi = \sqrt{xy} + \sqrt{4 - z^2}$ at the point A(1,1,2) with respect to the direction of $\vec{\ell} = -2\vec{i} + 2\vec{j} - \vec{k}$;

2.6.30. $\varphi = 5x^2 yz - 7xy^2 z + 5xyz^2$ at the point A(1,1,1) with respect to the direction $\vec{\ell} = 8\vec{i} - 4\vec{j} + 8\vec{k}$;