1. $u = x^3 + 3xy^2 + z^2 - 39x - 36y + 2z + 26$

$u_x' = 3x^2 + 3y^2 - 39x \quad u_y' = 6xy - 36 \quad u_z' = 2z + 2$

$u_{xy}'' = 6y \quad u_{yx}'' = 6y \quad u_{zy}'' = 0 \quad u_{zx}'' = 0 = u_{xz}'' = u_{yz}''$

$u_x'' = 6x \quad u_y'' = 6x \quad u_z'' = 2$

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2. $u = \frac{256}{x} + \frac{x^2}{y} + \frac{y^2}{z} + z^2$

$u_x' = -\frac{256}{x^2} + \frac{2x}{y} \quad u_y' = -\frac{x^2}{y^2} + \frac{2y}{z} \quad u_z' = -\frac{y^2}{z^2} + 2z$

$u_{xy}'' = -\frac{2x}{y^2} \quad u_{yx}'' = -\frac{2x}{y^2} \quad u_{zx}'' = 0 \quad u_{zy}'' = -\frac{2y}{z^2}$

$u_{yz}'' = -\frac{2y}{z^2}$; $u_x'' = \left(\frac{256}{x^3} + \frac{1}{y}\right) \cdot 2$, $u_y'' = \left(\frac{x^2}{y^3} - \frac{1}{z}\right) \cdot 2$

$u_z'' = 2\left(\frac{y^2}{z^3} + 1\right)$

3. $u = x^2 + y^2 + z^2$, $\vec{c}(-9{,}8, -12)$, $M = (8; -12; 9)$

$u'_x = 2x$, $u'_y = 2y$, $u'_z = 2z$

$\text{grad } u = (16, -24, 18)$, $|\vec{c}| = \sqrt{(-9)^2 + 8^2 + (-12)^2} = 17$

$\vec{c_0} = \frac{\vec{c}}{|c|} = \left(-\frac{9}{17}, \frac{8}{17}, -\frac{12}{17}\right)$

$u'_{\vec{c}} = \left(-\frac{144}{17}\right) + \left(-\frac{192}{17}\right) + \left(\frac{-216}{17}\right) = [illegible] 32 + \frac{8}{17}$

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4. $u = e^{x^2+y^2+z^2}$, $\vec{d} = (4, -13, -16)$, $L(-16; 4; -13)$

$u'_x = 2x e^{x^2+y^2+z^2}$, $u'_y = 2y e^{x^2+y^2+z^2}$, $u'_z = 2z^{x^2+y^2+z^2}$

$|d| = \sqrt{4^2 + (-13)^2 + (-16)^2} = 21$, $\vec{d_0} = \left(\frac{4}{21}, \frac{-13}{21}, \frac{-16}{21}\right)$

$\text{grad } u = \left(-32e^{441}, 8e^{441}, -26e^{441}\right)$

$u'_{\vec{d}} = e^{441} \cdot \left(\frac{-32 \cdot 4 - 13 \cdot 8 - 16 \cdot 26}{21}\right) = [illegible]$

$= -e^{441} \cdot \frac{648}{21}$

6. $U = x^2y + \frac{1}{3}y^3 + 2x^2 + 3y^2 - 1$

$$\begin{cases} U_x' = 2xy + 4x = 0 \\ U_y' = x^2 + y^2 + 6y = 0 \end{cases} \Rightarrow$$

$y = -2$

$x^2 + 4 - 12 = 0 \Rightarrow x_1 = -2\sqrt{2}$

$x_2 = 2\sqrt{2}$

$(-2\sqrt{2}, -2) \quad (2\sqrt{2}, -2)$

$U''_{xx} = 2y + 4 \quad U''_{xy} = 2x \quad U''_{yx} = 2x \quad U''_{yy} = 2y + 6$

$\begin{pmatrix} 0 & -4\sqrt{2} \\ -4\sqrt{2} & 2 \end{pmatrix}$ $\Delta_1 = 0 \rightarrow$ не работает

$\Delta_2 = 0 - 32 = -32$

$\begin{pmatrix} 0 & +4\sqrt{2} \\ 4\sqrt{2} & 2 \end{pmatrix}$ $\Delta_1 = 0 \rightarrow$ не работает

$$y = \frac{1}{1+e^{-ax+b}} \quad \left(y - \frac{1}{1+e^{-ax+b}}\right)^2 =$$

$$U_a' = -\frac{2x\left(y - \frac{1}{1+e^{-ax+b}}\right) \cdot e^{-ax+b}}{\left(e^{-ax+b}+1\right)^2}$$

$$U_b' = \frac{2\left(y - \frac{1}{1+e^{-ax+b}}\right) \cdot e^{-ax+b}}{\left(e^{-ax+b}+1\right)^2}$$