1) a) arg max $z = 4x^2 + xy - y^2 + 2x - 3y + 7$

$\frac{\partial f}{\partial x} = -8x + y + 2$

$\frac{\partial f}{\partial y} = -2y + x - 3$

$8x - y = 2 \quad /:2$

$-x + 2y = -3 \quad \curvearrowleft +$

$15x = 1$

$x = \frac{1}{15} \Rightarrow y = -\frac{22}{15}$

STACIONARA TACKA $\left(\frac{1}{15}, -\frac{22}{15}\right)$

$\frac{\partial^2 f}{\partial x^2} = -8$

$\frac{\partial^2 f}{\partial y^2} = -2$

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

Hessian $\nabla^2 f = \begin{pmatrix} -8 & 1 \\ 1 & -2 \end{pmatrix}$ $\Delta_1 = -8 (< 0)$

$\Delta_{2,2} = 15 (> 0)$

- negativno definitna
- maximum

$V = 9,2667$

b)

$$\arg\max z = 4x^2 + xy + y^2 + 2x - 3y + 7$$

$$\frac{\partial f}{\partial x} = 8x + y + 2 \qquad 8x + y + 2 = 0$$

$$\frac{\partial f}{\partial y} = 2y + x - 3 \qquad 2y + x - 3 = 0$$

$$15x = -7$$

$$x = -\frac{7}{15} \Rightarrow y = \frac{26}{15}$$

Stacionarna točka $\left(-\frac{7}{15}, \frac{26}{15}\right)$

$$\frac{\partial^2 f}{\partial x^2} = 8$$

$$\frac{\partial^2 f}{\partial y^2} = 2$$

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

Hesian $\nabla^2 f = \begin{pmatrix} 8 & 1 \\ 1 & 2 \end{pmatrix}$ $\Delta_1 = 8 > 0$, $\Delta_2 = 15 > 0$

- pozitivno definitna
- minimum

$V = 3,933$

c) $\arg\max := 4x^2 + xy - y^2 + 2x - 3y + 7$

$$\frac{\partial f}{\partial x} = 8x + y + 2 \qquad 8x + y = -2 \quad / \cdot 2$$

$$\frac{\partial f}{\partial y} = -2y + x - 3 \qquad x - 2y = 3 \quad \swarrow +$$

$$17x = -1$$

$$x = -\frac{1}{17} \Rightarrow y = -\frac{26}{17}$$

Stacionarna točka $\left(-\frac{1}{17}, -\frac{26}{17}\right)$

$$\frac{\partial^2 f}{\partial x^2} = 8 \qquad \frac{\partial^2 f}{\partial y^2} = -2 \qquad \frac{\partial^2 f}{\partial x \partial y} = 1$$

Hessian $\begin{pmatrix} -8 & 1 \\ 1 & -2 \end{pmatrix}$

$\Delta_1 = -8 \quad (<0)$

$\Delta_{1,2} = -17 \quad (<0)$

-indefinitna, sedlasta točka

$V = 0$

1) ekstrem $z = -4x^2 + xy + y^2 + 2x - 3y + 7$

$\frac{\partial f}{\partial x} = -8x + y + 2$

$\frac{\partial f}{\partial y} = 2y + x - 3$

$-8x + y = -2 \quad / \cdot (-2)$

$x + 2y = 3$

$17x = 7$

$x = \frac{7}{17} \Rightarrow y = \frac{22}{17}$

stacionarna točka $\left(\frac{7}{17}, \frac{22}{17}\right)$

$\frac{\partial^2 f}{\partial x^2} = -8$ Hessian $\nabla^2 f = \begin{pmatrix} -8 & 1 \\ 1 & 2 \end{pmatrix}$

$\Delta_1 = -8 (<0)$

$\frac{\partial^2 f}{\partial y^2} = 2$

$V = 0$

$\Delta_{1,2} = -17 (<0)$

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