Name: **Present group members:**

Worksheet 2-2: Q1

For the following symmetric matrices, cross out the classifications it **CANNOT** be due to the diagonal entries (don't calculate the eigenvalues).

- $A_1 = \begin{bmatrix} 0 & 1 \\ 1 & 5 \end{bmatrix}$ *pos def* *pos semidef* *indefinite* *neg def* *neg semidef*

- $A_2 = \begin{bmatrix} 2 & -1 \\ -1 & 1 \end{bmatrix}$ *pos def* *pos semidef* *indefinite* *neg def* *neg semidef*

- $A_3 = \begin{bmatrix} -1 & 2 \\ 2 & 1 \end{bmatrix}$ *pos def* *pos semidef* *indefinite* *neg def* *neg semidef*

- $A_4 = \begin{bmatrix} -3 & 1 \\ 6 & -2 \end{bmatrix}$ *pos def* *pos semidef* *indefinite* *neg def* *neg semidef*

For the following matrices with their given eigenvalues, what is the correct classification and why?

- $A_1 = \begin{bmatrix} 0 & 1 \\ 1 & 5 \end{bmatrix}$; eigvals $= \{-0.193, 5.193\}$ *pos def* *pos semidef* *indefinite* *neg def* *neg semidef*

- $A_2 = \begin{bmatrix} 2 & -1 \\ -1 & 1 \end{bmatrix}$; eigvals $= \{0.382, 2.618\}$ *pos def* *pos semidef* *indefinite* *neg def* *neg semidef*

- $A_3 = \begin{bmatrix} -1 & 2 \\ 2 & 1 \end{bmatrix}$; eigvals $= \{-2.236, 2.236\}$ *pos def* *pos semidef* *indefinite* *neg def* *neg semidef*

- $A_4 = \begin{bmatrix} -3 & 1 \\ 6 & -2 \end{bmatrix}$; eigvals $= \{-5, 0\}$ *pos def* *pos semidef* *indefinite* *neg def* *neg semidef*

Worksheet 2-2: Q2 On the last worksheet, we found the stationary points of the function

$$f(x, y) = 6x^2y - 3x^3 + 2y^3 - 150y$$

were at $p_1 = (0, 5)$ $p_2 = (0, -5)$ $p_3 = (4, 3)$ $p_4 = (-4, -3)$. Use the second optimality condition to classify each stationary point as a local minimum, local maximum, or saddle point.

You may use a computational tool to compute eigenvalues for you (although in these examples you shouldn't have to!). You can visually check your answer at desmos.com/3d/xa4komuwmb.

Worksheet 2-2: Q3

Find and classify the stationary points of $f(x) = 2x^3 + 3y^2 + 3x^2y - 24y$