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Quiz for Lecture 10

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Section 22

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1. Find the local maximum and minimum point(s), the local maximum and minimum values, and saddle point(s) of the function.

$$f(x, y) = 12x^2 - 4x^3 + 6y^2 + 12xy.$$

$$\frac{df}{dx} = 24x - 12x^2 + 12y \quad \cancel{12y}$$

$$\frac{df}{dy} = 12y + 12x$$

$$\frac{d^2f}{dx^2} = 24 - 24x$$

$$\frac{d^2f}{dy^2} = 12$$

$$\frac{d^2f}{dxdy} = 12$$

$$24x - 12x^2 + 12y = 0$$

$$12y + 12x = 0$$

$$-12x^2 + 12x = 0$$

$$-12x(x-1) = 0$$

$$x_1 = 0 \quad x_2 = 1.$$

$$y = 0 \quad \cancel{y} = -1.$$

$$f_{xx}(0, 0) = 24$$

$$f_{yy}(0, 0) = 12$$

$$f_{xy}(0, 0) = 12$$

$$f_{xx}(1, -1) = 0$$

$$f_{yy}(1, -1) = 12$$

$$f_{xy}(1, -1) = 12$$

$$D(0, 0) = 24 \cdot 12 - 12^2$$

$$= 144 > 0$$

$$f_{xx}(0, 0) = 24 > 0$$

$(0, 0)$ is local maximum and local maximum value is 0.

$$D(1, -1) = 0 \cdot 12 - 12^2$$

$$= -144 < 0$$

$(1, -1)$ is a saddle point and no max and min value.