

12/21

基礎演習

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C4.1-(b)

$$(1) f(x, y) = 3x + 4y^2 \text{ について}$$

$$f_x(x, y) = 3 \quad f_y(x, y) = 8y$$

$$f_x(0, 0) = 3 \neq 0 \quad f_y(0, 0) = 0 \quad \therefore f(x, y) \text{ は } (0, 0) \text{ で極値をとりません}$$

$$(2) f(x, y) = 3x^2 + 4y^2 \text{ について}$$

$$f_x(x, y) = 6x \quad f_y(x, y) = 8y$$

$$f_x(0, 0) = 0 \quad f_y(0, 0) = 0$$

$$\text{また } f_{xx}(x, y) = 6 \quad f_{yy}(x, y) = 8 \quad f_{xy}(x, y) = 0$$

$$f_{xx}(0, 0) = 6 \quad f_{yy}(0, 0) = 8 \quad f_{xy}(0, 0) = 0$$

$$f_{xx}(0, 0)f_{yy}(0, 0) - f_{xy}(0, 0)^2 = 48 - 0 > 0$$

$$f_{xx}(0, 0) = 6 > 0 \quad \therefore f(x, y) \text{ は } (0, 0) \text{ で極小値をとります}$$

$$(3) f(x, y) = -3x^2 + 4y^2 \text{ について}$$

$$f_x(x, y) = -6x \quad f_y(x, y) = 8y$$

$$f_x(0, 0) = 0 \quad f_y(0, 0) = 0$$

$$\text{また } f_{xx}(x, y) = -6 \quad f_{yy}(x, y) = 8 \quad f_{xy}(x, y) = 0$$

$$f_{xx}(0, 0)f_{yy}(0, 0) - f_{xy}(0, 0)^2 = -48 - 0 < 0$$

$$\therefore f(x, y) \text{ は } (0, 0) \text{ で極値をとりません}$$

$$(4) f(x, y) = 3x - 4y^2 \text{ について}$$

$$f_x(x, y) = 3 \quad f_y(x, y) = -8y$$

$$f_x(0, 0) = 3 \neq 0 \quad f_y(0, 0) = 0 \quad \therefore f(x, y) \text{ は } (0, 0) \text{ で極値をとりません}$$

$$(5) f(x, y) = 3x^2 - 4y^2 \text{ について}$$

$$f_x(x, y) = 6x \quad f_y(x, y) = -8y$$

$$f_x(0, 0) = 0 \quad f_y(0, 0) = 0$$

$$\text{また } f_{xx}(x, y) = 6 \quad f_{yy}(x, y) = -8 \quad f_{xy}(x, y) = 0$$

$$f_{xx}(0, 0)f_{yy}(0, 0) - f_{xy}(0, 0)^2 = -48 - 0 < 0$$

$$\therefore f(x, y) \text{ は } (0, 0) \text{ で極値をとりません}$$

$$(6) f(x, y) = -3x^2 - 4y^2 \text{ について}$$

$$f_x(x, y) = -6x \quad f_y(x, y) = -8y$$

$$f_x(0, 0) = 0 \quad f_y(0, 0) = 0$$

$$\text{また } f_{xx}(x, y) = -6 \quad f_{yy}(x, y) = -8 \quad f_{xy}(x, y) = 0$$

$$f_{xx}(0, 0)f_{yy}(0, 0) - f_{xy}(0, 0)^2 = 48 - 0 > 0$$

$$f_{xx}(0, 0) = -6 < 0$$

$$\therefore f(x, y) \text{ は } (0, 0) \text{ で極大値をとります}$$