DISCRETE STRUCTURES – Assignment #3

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2-BSCS-2

1. What is the domain of the square root of (x-y)/(x+y) as a real function? At what points is it discontinuous?

$$\sqrt{\frac{x-y}{x+y}}$$

taking the numerator

$$\sqrt{x-y}$$

$$x - y \geq 0$$

$$x \geq y \rightarrow \text{Domain}$$

The function is discontinues as the denominator

$$x + y \geq 0$$

$$x \geq -y \rightarrow \text{discontinuity}$$

Domain: x ≥ y

Points of discontinuity: x ≥ -y

2. If $f(x, y) = 2x^2 - xy$; what is $f_x(2, 3)$ and $f_y(2, 3)$?

$$f(x,y) = 2x^2 - xy$$

$$f_x(x,y) = \lim_{h \to 0} \frac{f(x+h,y) - f(x,y)}{h}$$

$$= \lim_{h \to 0} \frac{2(x+h)^2 - (x+h)y - 2x^2 - xy}{h}$$

$$= \lim_{h \to 0} \frac{2(x^2 + 2xh + h^2) - xy - hy - 2x^2 - xy}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{2x^2} + 4xh + 2h^2 - xy - hy - \cancel{2x^2} - xy}{h}$$

$$= \lim_{h \to 0} \frac{4xh + 2h^2 - 2xy - hy}{h}$$

$$= \lim_{h \to 0} \frac{2h^2 + 4xh - hy - 2xy}{h}$$

$$= \cancel{\lim_{h \to 0}} \; 2\cancel{h} + 4x - y - \cancel{\frac{2xy}{h}}$$

$$f_x(2,3) = 4x - y$$

$$= 4(2) - 3$$

$$= 8 - 3$$

$$\boxed{f_x(2,3) = 5}$$

$$f(x,y) = 2x^2 - xy$$

$$f_y(x,y) = \lim_{h\to 0} \frac{f(x,y+h) - f(x.y)}{h}$$

$$= \lim_{h\to 0} \frac{2x^2 - x(y+h) - 2x^2 - xy}{h}$$

$$= \lim_{h\to 0} \frac{\cancel{2x^2} - xy - xh - \cancel{2x^2} - xy}{h}$$

$$= \lim_{h\to 0} \frac{-xh - 2xy}{h}$$

$$= \lim_{h\to 0} -x - \frac{2xy}{h}$$

$$f_y(2,3) = -x$$

$$= -(2)$$

$$\boxed{f_y(2,3) = -2}$$

Answer:

$f_x(2, 3) = 5$ $f_y(2, 3) = -2$