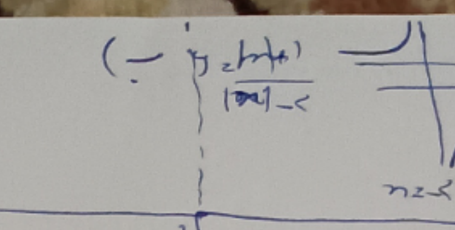
محمد شراکی

۱- الف)



$R_f = \mathbb{R} - (-\frac{1}{2}, 1]$

ب)

$\frac{|x|+1}{|x|} = 1 + \frac{1}{|x|} \Rightarrow R_f = [2, +\infty)$

۲- $\frac{x^2+1}{x^2} = \frac{(x-1)(x+1)+1}{x^2} = 1 - \frac{1}{x^2}$

$\Rightarrow x^2 \geq 2 \Rightarrow \frac{1}{x^2} \leq \frac{1}{2}$

$\Rightarrow -\frac{1}{x^2} \geq -\frac{1}{2}$

$\Rightarrow 1 - \frac{1}{x^2} \geq 1 - \frac{1}{2}$

$\Rightarrow f(x) \geq \frac{1}{2}$

$\Rightarrow R_f = [\frac{1}{2}, +\infty)$

۳- الف)

$f(x) = \frac{x^2}{x^2+1} \Rightarrow f'(x) = \frac{2x(x^2+1) - 2x^3}{(x^2+1)^2} = \frac{2x}{(x^2+1)^2}$

$f'(x) = 0 \Rightarrow x = 0$

$f(0) = 0$

$\lim_{x \to \infty} f(x) = \lim_{x \to \infty} \frac{x^2}{x^2+1} = 1$

$\Rightarrow R_f = [0, 1)$

ب)

$x^2 - x + 1 \to \Delta = 1 - 4 = -3 < 0 \to D_f = \mathbb{R}$

$x^2 - x + 1 = (x - \frac{1}{2})^2 + \frac{3}{4} \geq \frac{3}{4}$

$\Rightarrow \frac{1}{x^2 - x + 1} \leq \frac{4}{3}$

$\Rightarrow R_f = (0, \frac{4}{3}]$

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$f(x) = \frac{x^2}{x^2+1} \Rightarrow f'(x) = \frac{2x}{(x^2+1)^2}$

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$f(x) = 1 - x^2 \Rightarrow f'(x) = -2x$

$f'(x) = 0 \Rightarrow x = 0$

$f(0) = 1$

$1 - x^2 \geq 0 \Rightarrow x^2 \leq 1 \Rightarrow -1 \leq x \leq 1$

$f(-1) = 0$

$f(1) = 0$

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