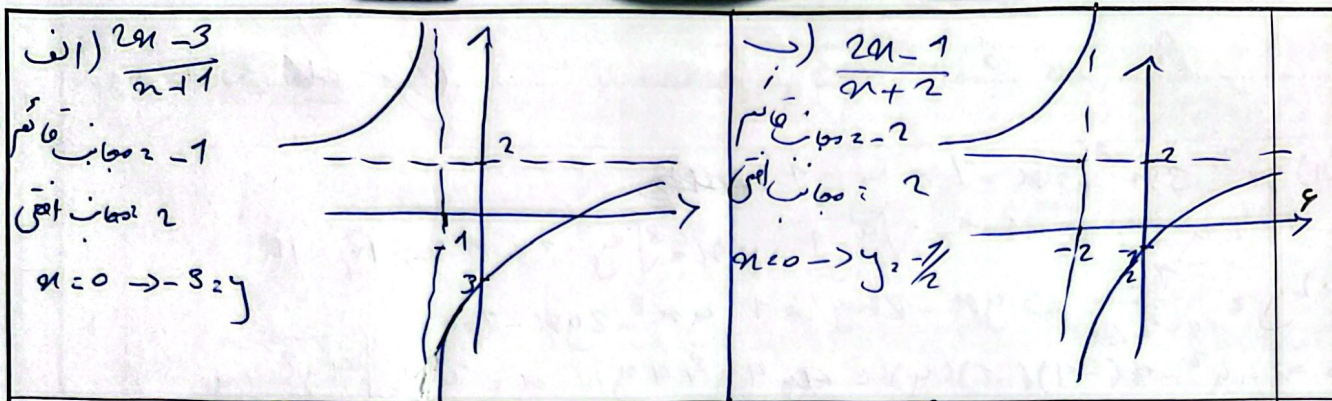


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| <p>الف) <math>x^3 - 3x^2 + 3x - 7 = y - 1</math></p> <p><math>(x-1)^3 = y - 1 \Rightarrow x-1 = \sqrt[3]{y-1} \Rightarrow x = \sqrt[3]{y-1} + 1 \Rightarrow R_f = \mathbb{R}</math></p> <p>ب) <math>y = \frac{1}{x^2 - 2x} \Rightarrow yx^2 - 2xy = 1 \Rightarrow yx^2 - 2xy - 1 = 0</math></p> <p><math>\Delta \Rightarrow 4y^2 - 4(-1)(-1)(y) = 4y^2 - 4y</math> <math>x = \frac{2y \pm \sqrt{4y^2 - 4y}}{2y}</math></p> <p><math>4y^2 - 4y \geq 0 \Rightarrow 4y(y-1) \geq 0</math></p> <p><math>R_f = (-\infty, -1] \cup (0, +\infty)</math></p> | <p>1</p>                                                                                                                                                                       |
| <p>الف) <math>x^2 - 4x + 10 = \frac{1}{2} \Rightarrow x^2 - 4x + \frac{19}{2} = 0</math></p> <p><math>\Delta \Rightarrow 16 - 4 \cdot \frac{19}{2} = -24</math></p> <p><math>\Rightarrow R_f = [6, +\infty)</math></p>                                                                                                                                                                                                                                                                                                                               | <p>ب) <math>-x^2 + 6x + 3 = y \Rightarrow \frac{\Delta}{4a} = \frac{-48 - 12}{-4} = 12</math></p> <p><math>\Rightarrow R_f = (-\infty, 12]</math></p> <p>2</p>                 |
| <p>الف) <math>y = x^3 - 5x^2 + 2x + 1</math></p> <p><math>\Rightarrow R_f = \mathbb{R}</math></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>ب) <math>y = x^3 - 6x^2 + 3x + 2 \Rightarrow R_f = \mathbb{R}</math></p> <p>توان هر</p> <p>3</p>                                                                            |
| <p>ع) <math>\sqrt{x^2 - 4x - 3} = y \Rightarrow \frac{\Delta}{4a} = \frac{-28}{4} = -7</math></p> <p><math>R_f = \sqrt{[-7, +\infty)} \Rightarrow R_f = [0, +\infty)</math></p>                                                                                                                                                                                                                                                                                                                                                                      | <p>د) <math>\sqrt{x^2 + 6x} = y \Rightarrow \frac{\Delta}{4a} = \frac{-36}{-4} = 9</math></p> <p><math>R_f = \sqrt{[-9, +\infty)} \Rightarrow R_f = [0, 9]</math></p> <p>4</p> |
| <p>الف) <math>y = \frac{3x+1}{x-3}</math></p> <p><math>R_f = \mathbb{R} - \{3\}</math></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p>ب) <math>y = \frac{2x+2}{x+1} \Rightarrow R_f = \mathbb{R} - \{2\}</math></p> <p>5</p>                                                                                      |



|                                                                                                                                                            |                                                                                                                                |   |
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| <p>الف) <math>y = \frac{1}{5} \ln(x+2)</math></p> <p><math>R_f = (-\infty, -2) \cup [2, +\infty)</math></p>                                                | <p>ب) <math>y = \frac{x^6 + 1}{x^3} = x^3 + \frac{1}{x^3}</math></p> <p><math>R_f = (-\infty, -2] \cup [2, +\infty)</math></p> | Y |
| <p>ج) <math>\frac{\sqrt[3]{x^2+1}}{\sqrt[3]{x}} = \sqrt[3]{x} + \frac{1}{\sqrt[3]{x}}</math></p> <p><math>R_f = (-\infty, -2] \cup [2, +\infty)</math></p> | <p>د) <math>y = \sqrt{x} + \frac{1}{\sqrt{x}}</math></p> <p><math>R_f = [2, +\infty)</math></p>                                |   |

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| <p>الف) <math>x^2 + \frac{1}{x^2+3} \rightarrow x^2 + 3 + \frac{1}{x^2+3} - 3</math></p> <p><math>x^2+3 = a \rightarrow a + \frac{1}{a} \rightarrow a + \frac{1}{a} \geq 2</math></p> <p><math>\rightarrow a + \frac{1}{a} - 3 \geq -1</math></p> <p><math>R_f = [-1, +\infty)</math></p> <p><math>a</math> همیشه مثبت است</p> | <p>ب) <math>x^2+4+1 = \sqrt{x^2+4} + \frac{1}{\sqrt{x^2+4}}</math></p> <p><math>\sqrt{x^2+4} \geq 2</math></p> <p><math>\min = 2 + \frac{1}{2} = \frac{5}{2}</math></p> <p><math>R_f = [\frac{5}{2}, +\infty)</math></p> | A |
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