

1. Determine the domain, in interval notation, for the following functions:

$$\text{i) } f(x) = \frac{\sqrt{2x+3}}{x-5}$$

$$\text{ii) } f(x) = \sqrt{\frac{2x-3}{3x+4}}$$

$$\text{iii) } f(x) = \frac{\sqrt{2x^3 - 3x^2 - 8x + 12}}{x-5}$$

$$\text{iv) } g(x) = \frac{\ln \frac{x^2 - x - 6}{x+1}}{x-5}$$

$$\text{v) } f(t) = \frac{\sqrt{2-t}}{2t^3 - 3t^2 + 1}$$

$$\text{vi) } g(x) = \frac{\sqrt{5-x}}{2x^3 - 5x^2 - 4x + 12}$$

$$\text{vii) } h(x) = \frac{\sqrt{2x^4 - 5x^3 - 3x^2}}{x^3 - 27}$$

2. Determine $\frac{f(x+h) - f(x)}{h}$ if:

$$\text{i) } f(x) = \frac{2x-1}{3x+4}$$

$$\text{ii) } f(x) = \frac{2x}{x^2-3}$$

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

$$\text{iv) } f(x) = 2x^2 - x - 3$$

Answers:

$$\text{1. i) } \left[-\frac{3}{2}, 5\right) \cup (5, \infty)$$

$$\text{ii) } \left(-\infty, -\frac{4}{3}\right) \cup \left[\frac{3}{2}, \infty\right)$$

$$\text{iii) } \left[-2, \frac{3}{2}\right] \cup [2, 5) \cup (5, \infty)$$

$$\text{iv) } (-2, -1) \cup (3, 5) \cup (5, \infty)$$

$$\text{v) } \left(-\infty, -\frac{1}{2}\right) \cup \left(-\frac{1}{2}, 1\right) \cup (1, 2]$$

$$\text{vi) } \left(-\infty, -\frac{3}{2}\right) \cup \left(-\frac{3}{2}, 2\right) \cup (2, 5]$$

$$\text{vii) } \left(-\infty, -\frac{1}{2}\right] \cup \{0\} \cup (3, \infty)$$

$$2. \quad \text{i)} \quad \frac{11}{(3x+4)(3x+3h+4)}$$

$$\text{ii)} \quad \frac{-2(x^2 + xh + 3)}{(x^2 - 3)((x + h)^2 - 3)}$$

$$\text{iii)} \quad \frac{6 + 2x^2 + 2xh + 2x + h}{(3 - x^2)(3 - x^2 - 2xh - h^2)}$$

$$\text{iv)} \quad 4x + 2h - 1$$