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

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

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

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

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

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

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

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

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

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

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

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

iv) $f(x)=2x^2-x-3$

Answers:

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

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

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

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

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

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

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

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

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

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

iv) $4x+2h-1$