1) Evaluate each limit

a) $\lim\limits_{x\to 2} \dfrac{3x}{x^2+2} = \dfrac{3(2)}{(2)^2+2}$

$= \dfrac{6}{6}$

$= 1$

b) $\lim\limits_{x\to -1}(x^4 + x^3 + x^2)$

$= (-1)^4 + (-1)^3 + (-1)^2$

$= 1 - 1 + 1$

$= 1$

c) $\lim\limits_{x\to 9}\left(\sqrt{x} + \dfrac{1}{\sqrt{x}}\right)^2$

$= \left(\sqrt{9} + \dfrac{1}{\sqrt{9}}\right)^2$

$= \left(3 + \dfrac{1}{3}\right)^2$

$= \left(\dfrac{10}{3}\right)^2$

$= \dfrac{100}{9}$

2) Evaluate the limit of each

a) $\lim\limits_{x\to 2} \dfrac{4-x^2}{2-x}$

$= \lim\limits_{x\to 2} \dfrac{(2-x)(2+x)}{2-x}$

$= 2 + 2$

$= 4$

b) $\lim\limits_{x\to -1} \dfrac{2x^2+5x+3}{x+1}$

$= \lim\limits_{x\to -1} \dfrac{(x+1)(2x+3)}{x+1}$

$= 2(-1) + 3$

$= 1$

c) $\lim\limits_{x\to 3} \dfrac{x^3-27}{x-3}$

$= \lim\limits_{x\to 3} \dfrac{(x-3)(x^2+3x+9)}{x-3}$

$= (3)^2 + 3(3) + 9$

$= 27$

d) $\lim\limits_{x\to 4} \dfrac{16-x^2}{x^3+64}$

$= \lim\limits_{x\to 4} \dfrac{(4-x)(4+x)}{(x+4)(x^2-4x+16)}$

$= \dfrac{4-4}{(4)^2-4(4)+16}$

$= \dfrac{0}{16}$

$= 0$

e) $\lim\limits_{x\to 4} \dfrac{x^2-16}{x^2-5x+6}$

$= \lim\limits_{x\to 4} \dfrac{(x-4)(x+4)}{(x-2)(x-3)}$

$= \dfrac{(4-4)(4+4)}{(4-2)(4-3)}$

$= \dfrac{0(8)}{2(1)}$

$= \dfrac{0}{2}$

$= 0$

f) $\lim\limits_{x\to -1} \dfrac{x^2+x}{x+1}$

$= \lim\limits_{x\to -1} \dfrac{x(x+1)}{x+1}$

$= -1$

3) Complete the following table and use results to estimate $\lim\limits_{x\to 2} \dfrac{x-2}{x^2-x-2}$

x	1.9	1.99	1.999	2.001	2.01	2.1
$\dfrac{x-2}{x^2-x-2}$	0.3448	0.3344	0.3334	0.3332	0.3322	0.3226

$\lim\limits_{x\to 2} \dfrac{x-2}{x^2-x-2} \approx \dfrac{1}{3}$

4) Use the graph to find the following limits:

a) $\displaystyle\lim_{x\to-1^+}\frac{x^2}{x+1}$ $= \infty$

b) $\displaystyle\lim_{x\to-1^-}\frac{x^2}{x+1}$ $= -\infty$

c) $\displaystyle\lim_{x\to-1}\frac{x^2}{x+1}$ Does not exist

$f(x) = \dfrac{x^2}{x+1}$
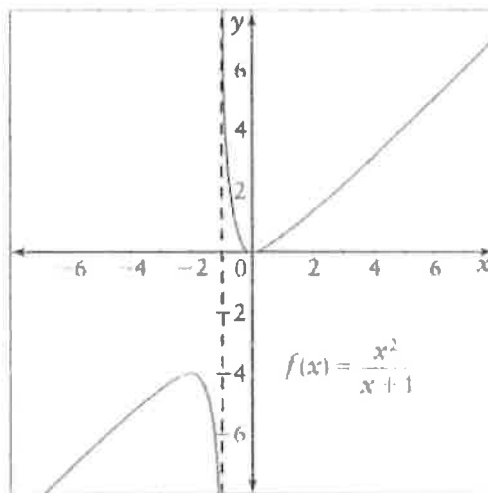
5) Use the graph to determine the following limits

a) $\displaystyle\lim_{x\to-1^+}h(x)$ $= -2$

b) $\displaystyle\lim_{x\to-1^-}h(x)$ $= 1$

$y = h(x)$

c) $\displaystyle\lim_{x\to-1}h(x)$ Does not exist

d) $\displaystyle\lim_{x\to3^+}h(x)$ $= 3$

e) $\displaystyle\lim_{x\to3^-}h(x)$ $= 2$

f) $\displaystyle\lim_{x\to3}h(x)$ Does not exist
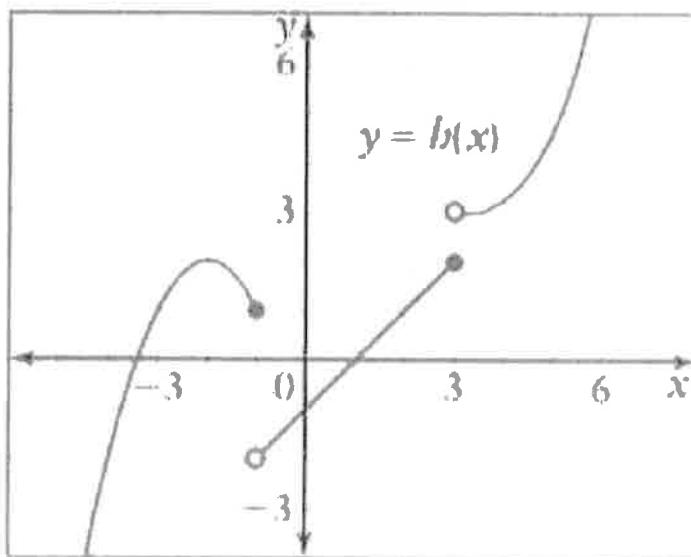
Answer Key

a) 1 **b)** 1 **c)** $\frac{100}{9}$ **2)a)** 4 **b)** 1 **c)** 27 **d)** 0 **e)** 0 **f)** -1   **3)** $\frac{1}{3}$ **4)a)** ∞ **b)** $-\infty$ **c)** does not exist
5)a) -2 **b)** 1 **c)** does not exist **d)** 3 **e)** 2 **f)** does not exist