

**King Fahd University of Petroleum and Minerals**  
**College of Science, Department of mathematical Sciences**  
**Math 101- Term 043**  
**Worksheet (2.1-2.3)**

\*\*\*\*\*

**Question1**

Find the limit. If it does not exist, so state that, or use  $\infty$  and  $-\infty$  where appropriate

1)  $\lim_{x \rightarrow 1} \frac{x^2 - 2x + 1}{x^2 - 1}$

2)  $\lim_{x \rightarrow \infty} \frac{x^2 - 2x + 1}{x^2 - 1}$

3)  $\lim_{x \rightarrow 1^-} \left[ 1 + \frac{1}{x-1} \right]$

4)  $\lim_{x \rightarrow 0^-} \frac{|x| - x}{x}$

5)  $\lim_{x \rightarrow +\infty} \sqrt{\frac{(x-1)(x-3)}{(1-x^2)(x-3)}}$

6)  $\lim_{x \rightarrow 0} \frac{\sqrt{x+9} - 3}{x}$

7)  $\lim_{x \rightarrow 0^+} \frac{|x|}{\sqrt{x}}$

8)  $\lim_{x \rightarrow +\infty} \sqrt{\frac{x^3}{(x+4)(2x^2+1)}}$

9)  $\lim_{x \rightarrow +\infty} \sqrt{x^2 + 2x} - \sqrt{x^2 - 2x}$

10)  $\lim_{x \rightarrow -\infty} \frac{1-2x}{\sqrt{x^2+1}}$

$$11) \lim_{x \rightarrow 2^-} f(x), \text{ where } f(x) = \begin{cases} \frac{|x-2|}{x-2}, & x < 2 \\ x & , x > 2 \end{cases}$$

$$12) \lim_{h \rightarrow 0} \frac{\frac{1}{2+h} - \frac{1}{2}}{h}$$

$$13) \lim_{x \rightarrow 1} \frac{\sqrt{x} - x^2}{1 - \sqrt{x}}$$

$$14) \lim_{x \rightarrow 2} \frac{\sqrt{6-x} - 2}{\sqrt{3-x} - 1}$$

$$15) \lim_{h \rightarrow 0} \frac{h}{h^2 - 3h + 1}$$

### **Question2**

Find the constant  $k$  so that  $\lim_{x \rightarrow -2} \frac{3x^2 + kx + k + 3}{x^2 + x - 2}$  exists. For that value of  $k$ , determine the limit.

### **Question3**

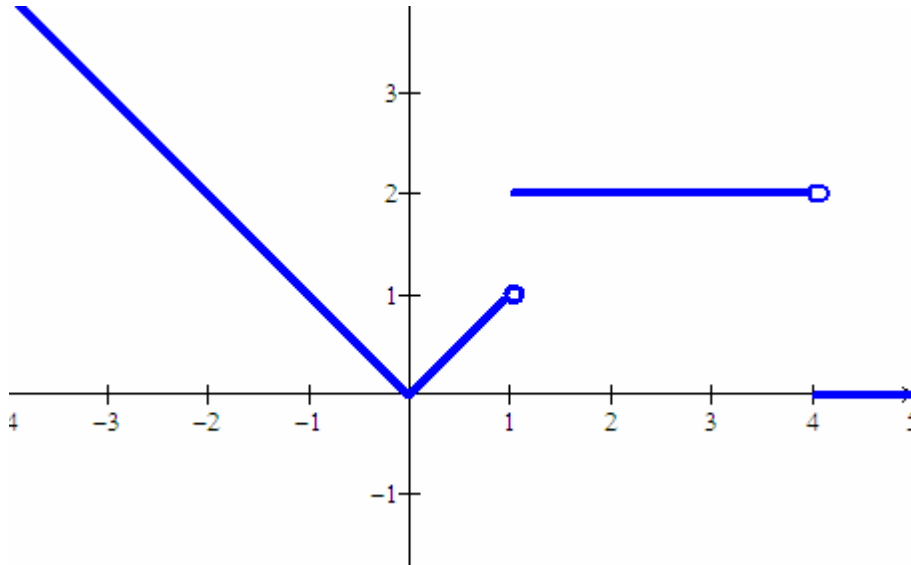
Find the horizontal and vertical asymptotes of the graph of the function  $f(x) = \frac{\sqrt{2x^2 + 1}}{3x - 5}$ .

### **Question4**

Let  $f(x) = \begin{cases} \frac{x^2 - 1}{x - 1}, & x \leq 1 \\ kx^2 + 3, & x > 1 \end{cases}$ . Find the value of  $k$  so that  $\lim_{x \rightarrow 1} f(x)$  exists.

### Question5

Use the graph of  $f(x)$  given below to find the following



a)  $\lim_{x \rightarrow 0} f(x)$

b)  $\lim_{x \rightarrow 1} f(x)$

c)  $\lim_{x \rightarrow 4} f(x)$

d)  $\lim_{x \rightarrow -1} f(x)$

e)  $\lim_{x \rightarrow 4} f(x)$

f)  $\lim_{x \rightarrow -\infty} f(x)$

g)  $\lim_{x \rightarrow +\infty} f(x)$

h)  $f(1), f(4), f(-2)$