SATPREP
Assignment – Limits – Algebraic

1. Evaluate each of the following limits :

(a) $\lim_{x \to 2} [2(x+3)+7]$

(b) $\lim_{x \to 0} (x^2 + 3x + 7)$

(c) $\lim_{x \to 1} [(x+3)^2 - 16]$

(d) $\lim_{x \to 1} [(x+1)^2 + 2]$

(e) $\lim_{x \to 0} [(2x+1)^3 - 5]$

(f) $\lim_{x \to 1} (3x+1)(x+1)$

2. Find the limits of each of the following functions :

(a) $\lim_{x \to 5} \dfrac{x-5}{x+2}$

(b) $\lim_{x \to 1} \dfrac{x+2}{x+1}$

(c) $\lim_{x \to 1} \dfrac{3x+5}{x-10}$

(d) $\lim_{x \to 0} \dfrac{px+q}{ax+b}$

(e) $\lim_{x \to 3} \dfrac{x^2 - 9}{x-3}$

(f) $\lim_{x \to 5} \dfrac{x^2 - 25}{x+5}$

(g) $\lim_{x \to 2} \dfrac{x^2 - x - 2}{x^2 - 3x + 2}$

(h) $\lim_{x \to \frac{1}{3}} \dfrac{9x^2 - 1}{3x - 1}$

3. Evaluate each of the following limits:

(a) $\lim_{x \to 1} \dfrac{x^3 - 1}{x - 1}$

(b) $\lim_{x \to 0} \dfrac{x^3 + 7x}{x^2 + 2x}$

(c) $\lim_{x \to 1} \dfrac{x^4 - 1}{x - 1}$

(d) $\lim_{x \to 1} \left[\dfrac{1}{x-1} - \dfrac{2}{x^2 - 1} \right]$

4. Evaluate each of the following limits :

(a) $\displaystyle\lim_{x\to 0} \frac{\sqrt{4+x}-\sqrt{4-x}}{x}$

(b) $\displaystyle\lim_{x\to 0} \frac{\sqrt{2+x}-\sqrt{2}}{x}$

(c) $\displaystyle\lim_{x\to 3} \frac{\sqrt{3+x}-\sqrt{6}}{x-3}$

(d) $\displaystyle\lim_{x\to 0} \frac{x}{\sqrt{1+x}-1}$

(e) $\displaystyle\lim_{x\to 2} \frac{\sqrt{3x-2}-x}{2-\sqrt{6-x}}$

5.　(a) Find $\displaystyle\lim_{x\to 0} \frac{2}{x}$, if it exists.

(b) Find $\displaystyle\lim_{x\to 2} \frac{1}{x-2}$, if it exists.

6. Find the values of the limits given below :

(a) $\displaystyle\lim_{x\to 0} \frac{x}{5-|x|}$

(b) $\displaystyle\lim_{x\to 2} \frac{1}{|x+2|}$

(c) $\displaystyle\lim_{x\to 2} \frac{1}{|x-2|}$

(d) Show that $\displaystyle\lim_{x\to 5} \frac{|x-5|}{x-5}$ does not exist.

7.　(a) Find the left hand and right hand limits of the function

$$f(x)=\begin{cases}-2x+3, & x\leq 1 \\ 3x-5, & x>1\end{cases} \text{ as } x\to 1$$

(b) If $f(x)=\begin{cases}x^2, & x\leq 1 \\ 1, & x>1\end{cases}$, find $\displaystyle\lim_{x\to 1} f(x)$

(c) Find $\displaystyle\lim_{x\to 4} f(x)$ if it exists, given that $f(x)=\begin{cases}4x+3, & x<4 \\ 3x+7, & x\geq 4\end{cases}$

8. Find the value of 'a' such that $\displaystyle\lim_{x\to 2} f(x)$ exists, where $f(x)=\begin{cases}ax+5, & x<2 \\ x-1, & x\geq 2\end{cases}$

9.　Let $f(x)=\begin{cases}x, & x<1 \\ 1, & x=1 \\ x^2, & x>1\end{cases}$

Establish the existence of $\displaystyle\lim_{x\to 1} f(x)$.

10. Find $\displaystyle\lim_{x\to 2} f(x)$ if it exists, where

$$f(x)=\begin{cases}x-1, & x<2 \\ 1, & x=2 \\ x+1, & x>2\end{cases}$$