Calculus Honors - M7H

Limits - Homework 1

1. Evaluate the following limits. Show your work:

(i) $\lim_{x\to 3}(2x+5)$

(ii) $\lim_{x\to 2}\dfrac{3x^2+5x-4}{x+1}$

(iii) $\lim_{x\to 4}\sqrt{x+5}$

(iv) $\lim_{x\to 2}(x^3+\sqrt{x})$

(v) $\lim_{x\to 0}\dfrac{|x|}{x^2+1}$

(vi) $\lim_{x\to -2}(x^2-4x+1)$

(vii) $\lim_{x\to 1}\dfrac{\frac{1}{x}-1}{x-1}$

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

(ix) $\lim_{x\to 2}\dfrac{x^3-8}{x^2-4}$

(x) $\lim_{x\to 1}\dfrac{x^4-1}{x^2-1}$

(xi) $\lim_{x\to 3}\dfrac{x^2+x-12}{x-3}$

(xii) $\lim_{x\to 5}\dfrac{x^2-9x+20}{x^2-7x+12}$

(xiii) $\lim_{x\to 1}\dfrac{2x^2-5x+3}{3x^2-8x+5}$

(xiv) $\lim_{x\to -1}\dfrac{x^3+x^2+x+1}{x^2-1}$

(xv) $\lim_{x\to 4}\dfrac{2-\sqrt{x}}{4-x}$

(xvi) $\lim_{x\to 2}\dfrac{\sqrt{x+2}-2}{x-2}$

(xvii) $\lim_{x\to 0}\dfrac{\sqrt{4+3x}-2}{x}$

(xviii) $\lim_{x\to 0}\dfrac{x^2}{\sqrt{1+x}-1}$

(xix) $\lim_{x\to 13}\dfrac{\sqrt{x-4}-3}{4-\sqrt{x+3}}$

(xx) $\lim_{x\to -5}\dfrac{|x+5|}{x^2+11x+30}$

(xxi) $\lim_{x\to 0}x^2\sin\left(\dfrac{1}{x}\right)$

2. Let $f(x)=\begin{cases}x^2-2x+1 & x<1\\ \sqrt{x+3} & x\geq 1\end{cases}$

Find $\lim_{x\to 5}f(x)$, $\lim_{x\to -3}f(x)$, and $\lim_{x\to 1}f(x)$.

3. Let $h(x) = \begin{cases} x^3 - x & x \leq 2 \\ \frac{x^2-4}{x-2} & x > 2 \end{cases}$

   Find $\lim_{x\to 1} h(x)$, $\lim_{x\to 4} h(x)$, and $\lim_{x\to 2} h(x)$

4. Let $p(x) = \begin{cases} |x^2 - 1| & x < 1 \\ 2 - \sqrt{2-x} & x \geq 1 \end{cases}$

   Find $\lim_{x\to 0} p(x)$, $\lim_{x\to 2} p(x)$, and $\lim_{x\to 1} p(x)$

5. Suppose for $x \neq 0$, $-x^2 \leq f(x) \leq x^2$. Find $\lim_{x\to 0} f(x)$

6. Suppose for $x \neq 0$, $x^2 \cos\left(\frac{1}{x}\right) \leq k(x) \leq x^2$. Find $\lim_{x\to 0} k(x)$.