Indian Institute of Technology Delhi - Abu Dhabi

AMTL100: CALCULUS

Tutorial Sheet 1: Limits

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(1) Find the following limits.

$(a)\ \lim_{x\to 0}\dfrac{\sqrt{5x+4}-2}{x}$ $(b)\ \lim_{x\to -1}\dfrac{\sqrt{x^2+8}-3}{x+1}$ $(c)\ \lim_{x\to 2}\dfrac{x^2-7x+10}{x-2}$

(2) Find the following limits.

$(a)\ \lim_{h\to 0}\dfrac{1-\cos h}{h}$ $(b)\ \lim_{h\to 0}\dfrac{\sin 2h}{3h}$ $(c)\ \lim_{x\to 0}\dfrac{\tan 3x}{\sin 8x}$

(3) If $\lim_{x\to 0}\dfrac{f(x)}{x^2}=1$, find

$a)\ \lim_{x\to 0} f(x)$ $(b)\ \lim_{x\to 0}\dfrac{f(x)}{x}$

(4) Prove that the limit of a function at a point must be unique, if it exists.

(5) Prove the Product Rule of limits.

(6) Prove that if $\lim_{x\to c} f(x)=L$, then $\lim_{x\to c}(f(x))^n=L^n$ for any positive integer n.

(7) Prove that if $\lim_{x\to c} f(x)=L$, where $L\neq 0$, then $\lim_{x\to c}\frac{1}{f(x)}=\frac{1}{L}$.

(8) Prove the Quotient Rule of limits.