	ANSWER KEY OF XI LIMITS AND DERIVATIVE
1	d
2	d
3	$\frac{dy}{dx}=\frac{-2}{(1+\sin 2x)}$
4	$\lim_{x\to 4}\frac{\lvert 4-x\rvert}{x-4}$ $L.H.L.\quad \lim_{x\to 4^-}\frac{-(4-x)}{x-4}=\lim_{x\to 4}\frac{-(4-x)}{-(4-x)}=1$ $R.H.L.\quad \lim_{x\to 4^+}\frac{4-x}{x-4}=\lim_{x\to 4}\frac{-(x-4)}{(x-4)}=-1$ $L.H.L.\neq R.H.L.$ $\therefore \lim_{x\to 4}\frac{\lvert 4-x\rvert}{x-4}$ does not exist does not exist
5	$y=\frac{(x+2)(3x-1)}{(2x+5)}$ $\frac{dy}{dx}=\frac{d}{dx}\frac{(x+2)(3x-1)}{(2x+5)}$ $=\frac{(2x+5)\frac{d}{dx}(x+2)(3x-1)-(x+2)(3x-1)\frac{d}{dx}(2x+5)}{(2x+5)^2}$ $=\frac{(2x+5)\left[(x+2)\frac{d}{dx}(3x-1)+(3x-1)\frac{d}{dx}(x+2)\right]-(x+2)(3x-1)[2+0]}{(2x+5)^2}$ $=\frac{(2x+5)[(x+2)\times 3+(3x-1)\times 1]-2[3x^2+6x-x-2]}{(2x+5)^2}$ $=\frac{(2x+5)[3x+6+3x-1]-6x^2-12x+2x+4}{(2x+5)^2}$ $=\frac{12x^2+30x+10x+25-6x^2-10x+4}{(2x+5)^2}$ $=\frac{6x^2+30x+29}{(2x+5)^2}$

6	$\lim\limits_{h\to 0}\dfrac{(a+h)^2\sin(a+x)-a^2\sin a}{h}$ $=\lim\limits_{h\to 0}\dfrac{(a^2+2ah+h^2)\sin(a+h)-a^2\sin a}{h}$ $=\lim\limits_{h\to 0}\dfrac{a^2\sin(a+h)+2ah\sin(a+h)+h^2\sin(a+h)-a^2\sin a}{h}$ $=\lim\limits_{h\to 0}\dfrac{a^2[\sin(a+h)-\sin a]+2ah\sin(a+h)+h^2\sin(a+h)}{h}$ $=\lim\limits_{h\to 0}\dfrac{a^2 2\cos\left[\dfrac{2a+h}{2}\right]\sin\dfrac{h}{2}}{2\dfrac{h}{2}}+\lim\limits_{h\to 0}2a\sin(a+h)+\lim\limits_{h\to 0}h\sin(a+h)$ $=a^2\cos\left[\dfrac{2a+0}{2}\right]\times 1+2a\sin[a+0]+0\times\sin a$ $=a^2\cos a+2a\sin a$
7	**(i) (2x - 7)(3x + 5)^2(30x - 43)** $\lim\limits_{y\to 0}\frac{(x+y)\sec(x+y)-x\sec x}{y}$ $=\lim\limits_{y\to 0}\frac{x\sec(x+y)+y\sec(x+y)-x\sec x}{y}$ $=\lim\limits_{y\to 0}\frac{[x\sec(x+y)-x\sec x]}{y}+\lim\limits_{y\to 0}\frac{y\sec(x+y)}{y}$ $=\lim\limits_{y\to 0}\frac{x[\sec(x+y)-\sec x]}{y}+\lim\limits_{y\to 0}\sec(x+y)$ $=\lim\limits_{y\to 0}\frac{x\left[\frac{1}{\cos(x+y)}-\frac{1}{\cos x}\right]}{y}+\lim\limits_{y\to 0}\sec(x+y)$ $=\lim\limits_{y\to 0}x\left[\frac{\cos x-\cos(x+y)}{y\cdot\cos(x+y)\cdot\cos x}\right]+\lim\limits_{y\to 0}\sec(x+y)$ $=\lim\limits_{y\to 0}\frac{x\begin{bmatrix}-2\sin\left(\frac{x+x+y}{2}\right)\\ \sin\left(\frac{x-x-y}{2}\right)\end{bmatrix}}{y\cos(x+y)\cdot\cos x}+\lim\limits_{y\to 0}\sec(x+y)$ $=\frac{x\left[-2\sin\left(x+\frac{y}{2}\right)\cdot\sin\left(-\frac{y}{2}\right)\right]}{\cos(x+y)\cdot\cos x\cdot y}+\lim\limits_{y\to 0}\sec(x+y)$ $=\lim\limits_{\substack{y\to 0\\ \therefore y\to 0}}x\left[\frac{\left[2\sin\left(x+\frac{y}{2}\right)\sin\left(\frac{y}{2}\right)\right]}{\cos(x+y)\cdot\cos x\cdot\left(\frac{y}{2}\right)\cdot 2}\right]+\lim\limits_{y\to 0}\sec(x+y)$ $\therefore$ Taking the limits we have $=x\left[\sin x\cdot\frac{1}{\cos x\cdot\cos x}\right]+\sec x$ **(ii)** = x sec x tan x + sec x = sec x (x tan x + 1)