Homework 3 (Due : 09/21)

Use your calculator to compute the following limits (if they exist) and then prove the result analytically.

1. $\lim_{x\to 1}\frac{x-1}{x+3}$
2. $\lim_{x\to 0}\frac{1}{|x|}$
3. $\lim_{x\to 3}\frac{x^2-9}{x-3}$
4. $\lim_{x\to 1}\frac{x-1}{x^2-2x+1}$
5. $\lim_{x\to 2}\frac{x^4-4x^2+4}{x-2}$
6. $\lim_{x\to 0}|x|\cos(x)$
7. $\lim_{x\to 3}\frac{\sqrt{x+1}-2}{x-3}$
8. $\lim_{x\to 0}\frac{1}{x+2x^2}-\frac{1}{x}$
9. $\lim_{x\to 4}\frac{x-4}{\frac{1}{x}-\frac{1}{4}}$
10. $\lim_{x\to 2} f(x)$ where $f(x)=\begin{cases}3x+1 & \text{if } x<2\\ x^2 & \text{if } x\geq 2\end{cases}$
11. $\lim_{x\to -3^+} f(x)$ where $f(x)=\begin{cases}x+1 & \text{if } x\leq -3\\ 7x & \text{if } x>-3\end{cases}$
12. $\lim_{x\to 0^+}\sin\left(\frac{1}{x}\right)$
13. $\lim_{x\to \frac{\pi}{2}}\tan(x)$
14. $\lim_{x\to 0}\cos(x)\,g(x)$ where $g(x)=\begin{cases}e^x & \text{if } x\geq 0\\ e^{-x} & \text{if } x<0\end{cases}$
15. $\lim_{x\to 0}x^2\sin\left(\frac{1}{x}\right)$
16. $\lim_{x\to 0}\frac{|x|}{x}$
17. $\lim_{x\to 0^+}\frac{\sqrt{x}}{x}$
18. $\lim_{x\to 0}\frac{\sqrt{1+x}-1}{x-1}$
19. $\lim_{x\to \frac{3\pi}{2}^+}\tan(x)$
20. $\lim_{x\to 1^-}\cos^{-1}(x)$