Name _____ Calculus Date _____

AIM: Derivatives as Limits. Numerical Derivatives.

I. DO NOW: If $f(x)=x^2-|2x-1|$, find a) $f'(2)$ b) $f'(-3)$ c) $f'\left(\frac{1}{2}\right)$

II.

Recall: 1) $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$

2) $f'(A)=\lim_{h\to 0}\frac{f(A+h)-f(A)}{h}$ 3) $f'(A)=\lim_{x\to A}\frac{f(x)-f(A)}{x-A}$

Find the value:

1) $\lim_{h\to 0}\frac{\sin(x+h)-\sin x}{h}$	2) $\lim_{h\to 0}\frac{(x+h)^6-x^6}{h}$
3) $\lim_{h\to 0}\frac{\sqrt[3]{8+h}-2}{h}$	4) $\lim_{h\to 0}\frac{\tan\left(\frac{\pi}{4}+h\right)-1}{h}$
5) $\lim_{x\to 3}\frac{x^4-81}{x-3}$	6) $\lim_{x\to\frac{\pi}{3}}\frac{\cos x-\frac{1}{2}}{x-\frac{\pi}{3}}$

7) $\lim_{h\to 0}\frac{\sec[2(x+h)]-\sec 2x}{h}$	8) $\lim_{x\to\frac{\pi}{2}}\frac{\cot\frac{1}{2}x-1}{x-\frac{\pi}{2}}$
9) $\lim_{h\to 0}\frac{\sqrt[3]{x+h}-\sqrt[3]{x}}{h}$	10) $\lim_{h\to 0}\frac{(1+h)^3-1}{h}$
11) $\lim_{x\to\pi}\frac{\tan\frac{x}{3}-\sqrt{3}}{x-\pi}$	12) $\lim_{\Delta x\to 0}\frac{\sin\left(\frac{\pi}{2}+\Delta x\right)-1}{\Delta x}$

III. Numerical Derivatives

To find a Numerical Derivative using calculator press MATH 8 nDeriv

FORMAT: nDeriv (function, x, value)

Example. Find $f'(2)$ if $f(x)=\frac{\sqrt{x^3-1}}{x^5+3x-1}$

Example. Find equation of the line tangent to

a) $f(x)=\sqrt{9-x^2}$ at $x=2$ b) $f(x)=x\sin x$ at $x=2$ c) $f(x)=e^{\frac{x}{2}}$ at $x=1$