AP Calculus AB
Finding Derivatives Using nDeriv

Notes

Given $f(x)=x^2\sin x$, we can find $f'(x)$ and $f'(\pi)$ using the product rule:

$$f'(x)=x^2\cos x+2x\sin x \quad \rightarrow \quad f'(\pi)=(\pi)^2\cos(\pi)+2(\pi)\sin(\pi)=-\pi^2$$

We can also evaluate $f'(\pi)$ using the function *nDeriv* on the TI-83 (**WHEN WE ARE ALLOWED!!!**)

The *nDeriv* function is found under **MATH, 8** on the TI-83.

To find the derivative of $f(x)$ (with respect to x) at $x=a$, we enter: $nDeriv(f,\, x,\, a)$

For the function given above, $f'(\pi)$ = $nDeriv\left(x^2\sin x,\ x,\ \pi\right) \doteq -9.8696 \doteq -\pi^2$ *same answer we got algebraically, above!*

We can also sketch the <u>graph</u> of $f'(x)$ by entering $Y_1 = nDeriv(f,\, x,\, x)$.

Assignment

Use *nDeriv* to find the derivatives of the following functions at the given values of $x=a$, and confirm the calculator's answers by finding the derivatives yourself, algebraically!!

$f(x)$	***a***	$f'(a)$ ***using nDeriv***	$f'(a)$ **Algebraically**
x^2+x+1	**5**		
$(x^2+1)(x^3+1)$	**-3**		
$\frac{2x+5}{3x-2}$	**1.5**		
$\frac{\sqrt{x}-1}{\sqrt{x}+1}$	**9**		
$\frac{\cos x}{1+\sin x}$	$\frac{\pi}{2}$		
$x\sin x - x\sec x$	$\frac{\pi}{4}$		
$e^x\tan x$	**0**		
$\lvert x\rvert$ (*abs* is under MATH, NUM)	**0**		

What do you notice about the value of $nDeriv(|x|,\ x,\ 0)$ and the value you obtained algebraically?

Who is correct? You or your calculator? Support <u>your</u> answer graphically.

What's wrong with *nDeriv*?

The *nDeriv* on the GC uses the following formula to evaluate the derivative of $f(x)$ at $x=a$:

$$f'(a)=\frac{f(a+0.001)-f(a-0.001)}{(2)(0.001)}$$

Explain **<u>clearly</u>** why this formula gives the correct derivative at $x=0$ for $f(x)=x^2$ but not for $f(x)=|x|$.