Maple Derivative Written Homework (file name: LastName.Derivative_W.mw)

REQUIRED REFERENCE

Maple Directions and Reference Page (hard copy or linked to your class homework page)
Maple Derivative Lab

Open and save a new "document mode" Maple worksheet in your home directory.

1. Find the derivatives of the following functions using the *Differentiation Tutor* to apply one rule at a time. Record a list of each rule as you use it in the order that you used it. Submit the list using *Text Typing* in Maple.

   For example: $y = 3x^2 + 2e^x + 5$ >>Note, the order of some components may vary<<
   Sum, constant multiple, power, constant multiple, exponential, constant

   a. $y = \dfrac{e^{3x+1}}{2+x}$
   It is easier to read if you reference your list; for example, "for f/g", "for f'", "for g'"

   b. $y = \sqrt{x^2+2x}(x^3-2x)$
   It is easier to read if you reference your list; for example, "for f*g", "for f'", "for g'"

2. Use Maple to help show the pattern $\dfrac{d}{dx}(\sin^n(x)\cos(nx)) = n\sin^{n-1}x\cdot\cos((n+1)x)$ for $n = 1, 2$ and 3 as follows.

   a. In Maple, determine the derivative of $y = \sin(x)\cos(x)$ You may find it helpful to define the function and call it *s1* (this is $\dfrac{d}{dx}(\sin^n(x)\cos(nx))$ for $n = 1$).

   By hand; use a trig identity to simply the derivative of *s1* to the desired $n\sin^{n-1}x\cdot\cos((n+1)x)$ form for $n = 1$.

   If you use *Maple* writing to show the math display and Text writing to type in words, **but don't hit enter**, you can do a fairly nice job of explaining and displaying your work.

   b. In Maple, determine the derivative of $\sin^n(x)\cos(nx)$ for $n = 2$ and then for $n = 3$. You may find it helpful to define functions and call them *s2* and *s3*, respectively.

   By hand; use a trig identity to simply each derivative to the $n\sin^{n-1}x\cdot\cos((n+1)x)$ form for $n = 2$ and then for $n = 3$. Use *Maple* writing to show the math display and Text writing to type in words,

3. Use Maple to help find the pattern for $\frac{d}{dx}(\cos^n(x)\cos(nx))$ for as follows.

   a. In Maple, determine the derivative of $y = \cos(x)\cos(x)$ (this is $\frac{d}{dx}(\cos^n(x)\cos(nx))$ for $n = 1.$)

   b. In Maple, determine the derivative of $\cos^n(x)\cos(nx)$ for $n = 2$ and then for $n = 3.$

      By hand; use a trig identity for each case to simply the derivative to a pattern that is similar to the pattern from #2. You may find it easier to simply for $n = 2$ and $n = 3$ before you do $n = 1.$

      Use a combination of *Maple* writing to show the math display and Text writing to type in words to explain and display your work.

   c. What is the pattern for $\frac{d}{dx}(\cos^n(x)\cos(nx))$? Use a combination of *Maple* writing to show the math display and Text writing to type in words to explain your conjecture.

4.

   a. In Maple, define the function $c(x) = 2\cos(3x + \pi)$

   b. Use Maple to determine $c(\frac{\pi}{6})$ and to determine $c'(\frac{\pi}{6})$

   c. Determine the equation of the tangent line to $c(x)$ at $t = \frac{\pi}{6}$ and, in Maple, define the tangent function $t(x)$ as the equation of the tangent line to $c(x)$ at $t = \frac{\pi}{6}$.

   d. (Using *Text Typing* in Maple): What is the period of $c(x)$?

   e. (Using *Text Typing* in Maple): What is the range of $c(x)$?

   f. Plot $c(x)$ and $t(x)$ together.

      For the period, P, of $c(x)$, set the plot window for two cycles: $-P \le t \le P$

      For the range of $-a \le y \le a$, set the plot window for just under and just over the range: $-a - .5 \le y \le a + .5$

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