

THE UNIVERSITY OF AKRON
Theoretical and Applied Mathematics

The AcroTeX Bundle
Math Fill-in: Multivariate Questions

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Quiz Answer each of the following. Passing is 100%.

$$1. \frac{\partial}{\partial x} 4x^2y^3 =$$

$$2. \frac{\partial}{\partial y} 4x^2y^3 =$$

$$3. \frac{\partial^2}{\partial xy} 4x^2y^3 =$$

$$4. \frac{\partial}{\partial z} x \sin(yz^3) =$$

$$5. \int 4x^2y^3 dy =$$

Let's take a look at the first question in detail, but first, recall the specification of the `\RespBoxMath` command. The `\RespBoxMath` has ten parameters that can be used to modify the default behavior of processing the user's input. Here is the syntax:

```
\RespBoxMath[#1]#2(#3)[#4]#5#6#7#8[#9]**#10
```

Parameters:

#1: Optional parameter used to modify the appearance of the text field.

- #2: The correct answer to the question. This must be a numerical value, or a function of one variable. JavaScript Note: In JavaScript, functions such as `sin(x)` and `cos(x)` are methods of the `Math` object. It is not necessary, however, to type `Math.sin(x)` or `Math.cos(x)`; this is done by inserting the expression into a `with(Math)` group.
- #3: An optional parameter, *delimited by parentheses*, that defines the independent variable; `x`, is the default value. Note that this parameter is set off by parentheses. For a multivariate question, just list the variables in juxtaposition, `(xyz)`.
- #4: Optional, a named destination to the solution to the question. If this parameter appears, then a solution must follow the question, enclosed in a `solution` environment.
- #5: The number of samples points to be used, usually 3 or 4 is sufficient.
- #6: Precision required, the ϵ value, if you will.
- #7: Parameters #7 and #8 are used to define the interval from which to draw the sample points. There are two forms: (1) #7 is the left-hand endpoint of the interval and #8 is the right-hand endpoint (the use of #7 and #8 in this form is deprecated); (2) the interval is defined by standard interval notation, `[a,b]`. For a multivariate question—one where parameter #2 lists more than one variable, separate the intervals for each variable by a 'x', `[0,2]x[1,2]x[3,4]`. Here, 'x' stands for the Cartesian Product.
- #8: (1) Parameter #8 is the right-hand endpoint of the interval (the use of this parameter is deprecated); (2) in the second case, #8 is not used.
- #9: This optional parameter is the name of a customized comparison function.
- #10: (Only detected if following an asterisk, '*') The name of a JavaScript function that is to be used to process the user input.

► Discussion of the first question:

```


$$\frac{\partial}{\partial x} \{4x^2y^3\}$$


$$=\text{RespBoxMath}\{8xy^3\}(xy)\{2\}\{.0001\}\{[0,1]x[0,1]\&[-2,-1]x[-2,-1]\}$$


```

Following `\RespBoxMath` comes the correct answer (parameter #2). Next comes `(xy)` (parameter #3), which specifies that the question is a function of two variables x and y . This question has no solution associated so there is the no optional parameter #4 listed. Now comes the number of sample points (parameter #5) specified as 2, followed by the precision of .0001, parameter #6. Finally comes the regions from which we are to sample our points, parameter #7. Here, we specified the regions to be $[0, 1] \times [0, 1] \& [-2, -1] \times [-2, -1]$.

The above parameters specifies that we must randomly choose two points (x, y) from the rectangle $[0, 1] \times [0, 1]$ and randomly choose two points (x, y) from the rectangle $[-2, -1] \times [-2, -1]$. This then actually produces four points.