How to Enter Answers in WeBWorK

1. **Mathematical Symbols Available in WeBWorK**

   - + Addition
   - - Subtraction
   - * Multiplication. Multiplication may also be indicated by a space or juxtaposition, that is, just writing symbols next to each other, e.g. 2x, 2 x or 2*x, also 2(3+4). You can use the latter form, without a space, only provided no misunderstanding is possible. For example, you wouldn't enter 34 for 3*4. To be on the safe side, you should always use * for multiplication.
   - / Division
   - ^ or ** Denotes powers. (2^3 and 2**3 are the same to WeBWorK)
   - All kinds of brackets and paretheses: (...), [...], {...}

2. **Syntax for entering expressions**

   - Be careful entering expressions just as you would be careful entering expressions in a calculator.

   - Sometimes using the * symbol to indicate multiplication makes things easier to read. For example (1+2)*(3+4) and (1+2)(3+4) are both valid. So are 3*4 and 3 4 (3 space 4, not 34) but using a * makes things clearer.

   - Use ('s and)'s to make your meaning clear. You can also use ['s and]'s and {'s and }'s.

   - Don't enter 2/4+5 (which is 5.5) when you really want 2/(4+5) (which is 2/9).

   - Don't enter 2/3*4 (which is 8/3) when you really want 2/(3*4) (which is 2/12).

   - Entering big quotients with square brackets, e.g. [1+2+3+4]/[5+6+7+8], is a good practice.

   - Be careful when entering functions. It's always good practice to use parentheses when entering functions. Write sin(t) instead of sint or sin t. But WeBWorK is smart enough to accept sin t or even sint. But sin 2t is really sin(2)t, i.e. (sin(2))*t. Be careful.

   - Be careful entering powers of trigonometric, and other, functions. You write (sin(t))^2 for the square of sin(t), and *never* sin^2t.

   - For example, 2+3sin^2(4x) is wrong. You should enter: 2+3*(sin(4*x))^2. Why does the last expression work? Because things in parentheses are always done first [i.e. (4*x), and then (sin(4*x))], next all exponents are taken, giving (sin(4*x))^2, next all multiplications and divisions are performed, giving 3*(sin(4*x))^2. Finally, all additions and subtractions are performed, giving 2+3*(sin(4*x))^2.

     You could have entered 2+3sin(4x)^2. (Indeed, things in parentheses go first, giving (4x), next functions are evaluated, giving sin(4x), next all exponents are taken giving sin(4x)^2, next all multiplications and divisions are performed, giving 3sin(4x)^2. Finally, all additions and subtractions are done, leading to 2+3sin(4x)^2.) However, isn't 2+3*(sin(4*x))^2 much clearer than 2+3sin(4x)^2? Why not be clear?

   - Remember that multiplication and division have the same precedence and there are no universal rules as to which should be done first in the absence of paretheses. WeBWorK and many

computers read things from left to right, so 2/3*4 means (2/3)*4=8/3. But some other computers will read 2/3*4 as 2/(3*4)=1/6. The same lack of consistent rules concerns powers, expressions like 2^3^4.

The only way to make sure that you are entering what you want to enter is the use of parentheses!!!

- Use the "Preview Button" to see exactly how your entry looks. E.g. to tell the difference between 1+2/3+4 and [1+2]/[3+4] click the "Preview Button".

- If a problem calls for a decimal answer, give at least four decimal digits, or as many as the problem specifies. For example, write 2.3453 instead of 2.34.

3. **Intervals in WeBWorK**

- What is the domain of f(x)=sqrt(x)? On answer is x>=0 (x is greater than or equal to 0). The way to enter this in WeBWorK is in interval notation: [0,infinity).
- Other intervals:
  - (2,3] is the set 2<x<=3.
  - (-infinity,5) is the set x<5.
  - (-infinity, infinity) is the set of all real numbers.
  - (2,3]U[4,5) is the set 2<x<=3 or 4<=x<5. (This is a union of two intervals and can be very important.)

4. **Mathematical Constants Available In WeBWorK**

- pi This gives 3.14159265358979, e.g. cos(pi) is -1
- e This gives 2.71828182845905, e.g. ln(e*2) is 1 + ln(2)

5. **Scientific Notation Available In WeBWorK**

- 2.1E2 gives 210
- 2.1E-2 gives .021

6. **Cube roots and such**

- x^(1/3) gives the cube root of x
- Other roots are also done with fractional exponents.

7. **Mathematical Functions Available In WeBWorK**

- abs( ) The absolute value
- cos( ) Note: cos( ) uses radian measure
- sin( ) Note: sin( ) uses radian measure
- tan( ) Note: tan( ) uses radian measure
- sec( ) Note: sec( ) uses radian measure
- exp( ) The same function as e^x
- log( ) The natural log
- ln( ) Another name for the natural log
- logten( ) The log to the base 10
- arcsin( )
- asin( ) Another name for arcsin
- arccos( )
- acos( ) Another name for arccos
- arctan( )

- atan( ) Another name for arctan
- sinh( )
- cosh( )
- tanh( )
- sech( )
- sqrt( )
- sgn( ) The sign function, either $-1, 0$, or 1
- step( ) The step function (0 if $x < 0$, 1 if $x >= 0$)
- fact( ) The factorial function (defined only for non negative integers)