

How to Enter Answers in WeBWorK

Addition $+$ $a+b$ gives $a + b$

Subtraction $-$ $a-b$ gives $a - b$

Multiplication $*$ $a*b$ gives ab

Multiplication may also be indicated by a space or juxtaposition, such as $2x$, $2\ x$, $2*x$, or $2(x+y)$.

Division $/$ a/b gives $\frac{a}{b}$

Exponents $^$ or $**$ a^b gives a^b as does $a**b$

Parentheses, brackets, etc $(...)$, $[...]$, $\{...\}$

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 an explicit multiplication symbol makes things clearer.
- Use parentheses $()$, brackets $[]$, and curly braces $\{\}$ to make your meaning clear.
- Do not enter $2/4+5$ (which is $5\ \frac{1}{2}$) when you really want $2/(4+5)$ (which is $2/9$).
- Do not 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 is always good practice to use parentheses when entering functions. Write $\sin(t)$ instead of sint or $\sin\ t$. WeBWorK has been programmed to accept $\sin\ t$ or even sint to mean $\sin(t)$. 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* $\sin^2 t$.
- For example for the expression $2 + 3\sin^2(4x)$, $2+3\sin^2(4x)$ is wrong. You should enter: $2+3*(\sin(4*x))^2$. Why does the last expression work?

Please Excuse My Dear Aunt Sally

Operations in parentheses are always done first ($4*x$) 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 $2+3*(\sin(4*x))^2$.

- 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 parentheses. 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 insure that you are entering what you want to enter is the use of parentheses!!!

- Use the Preview Button to see exactly how your entry appears to the system. For example, 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.

Intervals in WeBWorK

What is the domain of $f(x) = \sqrt{x}$? One answer is $x \geq 0$ (x is greater than or equal to 0). The best way to enter this in WeBWorK is by using interval notation: $[0, \text{infinity})$.

Other intervals:

$(2,3]$ is the set $2 < x \leq 3$.

$(-\text{infinity}, 5)$ is the set $x < 5$.

$(-\text{infinity}, \text{infinity})$ is the set of all real numbers.

$(2,3] \cup [4,5)$ is the set $\{2 < x \leq 3 \text{ or } 4 \leq x < 5\}$. (This is a union of two intervals and can be very important.)

Mathematical Constants Available In WeBWorK

pi This gives $\pi \approx 3.14159265358979$. So $\cos(\text{pi})$ is -1 .

e This gives $e \approx 2.718281828459045$. So, $\ln(e*2)$ is $1 + \ln(2)$

Scientific Notation Available In WeBWorK

2.1E2 gives 210

2.1E-2 gives 0.021

aEb gives $a \times 10^b$

Cube roots and n th Roots

$x^{(1/3)}$ gives $\sqrt[3]{x}$, the cube root of x

$x^{(1/n)}$ gives $\sqrt[n]{x}$, the n th root of x

$x^{(p/q)}$ gives $(\sqrt[q]{x})^p$

Mathematical Functions Available In WeBWorK

- abs() $|x|$, the absolute value
- cos() the cosine function. Note: the cosine function uses radian measure
- sin() the sine function. Note: the sine function uses radian measure
- tan() the tangent function. Note: the tangent function uses radian measure
- sec() the secant function. Note: the secant function uses radian measure and

$$\sec(x) = \frac{1}{\cos(x)}$$
- exp() the exponential function, e^x
- log() The natural logarithm function. Note that this is NOT the common log function from pre- $\text{fact}(n) = n(n-1)(n-2)\cdots(3)(2)(1)$ calculus.
- ln() Another, more common name for the natural logarithm, $\ln(x)$
- logten() The common logarithm or log base 10, $\log_{10}(x)$
- arcsin() The inverse sine function. $\text{asin}()$ is another name for arcsine.
- arccos() The inverse cosine function. $\text{acos}()$ is another name for arccosine.
- arctan() The inverse tangent function. $\text{atan}()$ is another name for arctangent.
- sqrt() The square root function
- sgn() The sign function —
$$\text{sgn}(x) = \begin{cases} -1 & \text{if } x < 0 \\ 0 & \text{if } x = 0 \\ 1 & \text{if } x > 0 \end{cases}$$
- step() The step function —
$$\text{step}(x) = \begin{cases} 0 & x < 0 \\ 1 & x \geq 0 \end{cases} \quad (0 \text{ if } x < 0, 1 \text{ if } x \geq 0)$$
- fact() The factorial function (defined only for non-negative integers),

$$\text{fact}(n) = (n)(n-1)(n-2)\cdots(3)(2)(1)$$