MacQTEX self-testing quizzes

How to do Fill-in Questions

Syntax and Examples

Instructions for the fill-in questions,
with some examples for practice.

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Mathematics Fill-In Questions

The fill-in questions allow you to type in your answers to mathematical problems. Once you have typed it in, your answer is checked to make sure that what you have typed is in the correct form to process properly. You will see an error message if the processor doesn't understand what you have typed.

This means you need to learn what syntax it will accept. The syntax is very similar to that used in many programming languages.

The syntax processor is fairly tolerant, for example, if you type `(x+1)*(x+2)`, it knows that this is the same as `(x+2)*(x+1)`. It knows that `x^(-1)` is the same as `1/x`. Likewise for most expressions which are equivalent mathematically.

If your answer is a decimal, and you enter too many places after the point, these will be ignored. For example, if the answer is 1.567, and you type 1.5672, this will be marked correct, but 1.56 will not. In this case you won't get an error message to warn you, so be careful!

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Instructions

To answer a Fill-in question, use the following notation.

- For multiplication use `*`, type `4*x` for $4x$;
- For indices use `^`, type `4*x^3` for $4x^3$, `12*x^(-6)` for $12x^{-6}$.
- Use parentheses to delimit the argument of a function; i.e., type `sin(x)` rather than `sin x`.
- Use parentheses to define the *scope* of an operation. For example, type
  - `4*x*(x^2+1)^3` for $4x(x^2+1)^3$;
  - `4^(2*x+1)` for 4^{2x+1};
  - `(sin(x))^2` for $(\sin(x))^2$.

  Note: you cannot type `sin^2(x)` for $\sin^2(x)$, type `(sin(x))^2` instead.
- You can also use brackets `[ ]` or braces `{ }`, to delimit a mathematics expression. So if you think that `(x*(sin(2*x))^2+1)/2` looks too confusing, you can use `{x*[sin(2*x)]^2+1}/2`.
- Functions you may use:
  - Trig: `sin`, `cos`, `tan`, `cot`, `sec`, `csc`;



- Inverse Trig: `asin`, `acos`, `atan` (remember these are normally written as $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$);
- Log: `ln` (natural log), or use `log`; e.g. `ln(x)`;
- Exponential: for e^x, enter `e^x` or `exp (x)` (include the space between `exp` and (x)).
- Absolute value: `abs(·)` can also be written in the usual way `|·|`; thus, you can type either `abs(x)` or `|x|`.
- Square roots: use `sqrt(x)` for $\sqrt{x}$ (or, use exponential notation: `x^(1/2)`).

When you type in your answer, some attempt will be made to determine whether it is a valid mathematical expression. For example, if you say `san(x)`, the function '`san`' will not be recognized as a valid mathematical function, and you will get an error message. You may change your answer as many times as you like without affecting your score, provided you haven't clicked on End Quiz.

There is also checking for unbalanced parentheses; for example, if you type `((x^4+1) + sin(x)^2`, this will give a syntax error, and produce an error message.

Addition, multiplication, division and powers

- Try typing in the expression $f(x) = 3x(2x+1)(x-5)$ as `3*x*(2*x+1)*(x-5)`.

$$f(x) =$$

Now try reversing the order of the brackets.

- Type in the expression $f(x) = x^2(4x+1)/(x-5)$ as `x^2*(4*x+1)/(x-5)`.

$$f(x) =$$

- Type in the expression $f(x) = 2x^3(x^4+1)^{x+1}$ as `2*x^3*(x^4+1)^(x+1)`.

$$f(x) =$$

- Type in the expression $f(x) = x^{10}(2x^2+1)^{-1}$ as `x^10*(2*x^2+1)^(-1)`.

$$f(x) =$$

Can you rewrite this without using indices?

- Enter the expression $f(x) = (5x^2+1)^{1/2}$ as `(5*x^2+1)^(1/2)`.

$$f(x) =$$

Try this using `sqrt` instead of indices.

Now try some of these for practice.

$$x(3x^2 - 5)(4 - x^3) = \boxed{}$$

$$\frac{4x + 1}{1 - x^2} = \boxed{}$$

$$\frac{x^{-1} + 5}{(x + 1)^{1/2}} = \boxed{}$$

$$x(x^2 - 3)^{-1}(x + 1) = \boxed{}$$

Functions

You have already tried out the `sqrt` function, the others work the same way.

- Try typing in the expression $f(x) = \sin(x - 5)$ as `sin(x-5)`.

$$f(x) =$$

- Try typing in the expression $f(x) = \cos^2(2x - 1)$ as `(cos(2*x-1))^2`.

$$f(x) =$$

Remember that you can't type `cos^2(2*x-1)`!

- This expression is more complicated: $f(x) = \cos(\tan(x^2 - 2))$ so type `cos(tan(x^2-2))`.

$$f(x) =$$

- Now try $f(x) = e^{\cot x^3}$, type `e^(cot(x^3))`.

$$f(x) =$$

Now try it using `exp` instead. Can you express this using `tan` instead of `cot`?

- Now we should deal with inverse trig functions such as $\sin^{-1} x$.
  Remember that this does not mean $\dfrac{1}{\sin x}$ but is the function which reverses what the `sin` function does.
  So for $\sin^{-1}(x^2)$ type `asin(x^2)`.

$$f(x) =$$

  Note that `sin^(-1)(x^2)` gives a syntax error, and `(sin(x^2))^(-1)` is the syntax for $\dfrac{1}{\sin(x^2)}$.

- Now try $f(x) = |x - 5|$, you may type `abs(x-5)` or `|x-5|`.

$$f(x) =$$

Now try some of these for practice.

$\sqrt{3x^{5-2x}+1} =$ [ ]

$\sec^2(\tan(2x)) =$ [ ]

$\sin(x+1)\,\cos(x+1) =$ [ ]

$\cos^{-1}\left(\frac{x}{2}\right) =$ [ ]

$\frac{1}{\cos\left(\frac{x}{2}\right)} =$ [ ]

$$e^{\log(4x^2)} = \boxed{}$$

If you know your rules for logs and exponentials, you will notice that there is a really simple way to express this!

$$\log\left(|\sin(2x)|\right) = \boxed{}$$

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