ffi_const

The tracking issue for this feature is: #58328

The `#[ffi_const]` attribute applies clang's `const` attribute to foreign functions declarations.

That is, `#[ffi_const]` functions shall have no effects except for its return value, which can only depend on the values of the function parameters, and is not affected by changes to the observable state of the program.

Applying the `#[ffi_const]` attribute to a function that violates these requirements is undefined behaviour.

This attribute enables Rust to perform common optimizations, like sub-expression elimination, and it can avoid emitting some calls in repeated invocations of the function with the same argument values regardless of other operations being performed in between these functions calls (as opposed to `#[ffi_pure]` functions).

Pitfalls

A `#[ffi_const]` function can only read global memory that would not affect its return value for the whole execution of the program (e.g. immutable global memory). `#[ffi_const]` functions are referentially-transparent and therefore more strict than `#[ffi_pure]` functions.

A common pitfall involves applying the `#[ffi_const]` attribute to a function that reads memory through pointer arguments which do not necessarily point to immutable global memory.

A `#[ffi_const]` function that returns unit has no effect on the abstract machine's state, and a `#[ffi_const]` function cannot be `#[ffi_pure]`.

A `#[ffi_const]` function must not diverge, neither via a side effect (e.g. a call to `abort`) nor by infinite loops.

When translating C headers to Rust FFI, it is worth verifying for which targets the `const` attribute is enabled in those headers, and using the appropriate `cfg` macros in the Rust side to match those definitions. While the semantics of `const` are implemented identically by many C and C++ compilers, e.g., clang, GCC, ARM C/C++ compiler, IBM ILE C/C++, etc. they are not necessarily implemented in this way on all of them. It is therefore also worth verifying that the semantics of the C toolchain used to compile the binary being linked against are compatible with those of the `#[ffi_const]`.