Refactoring and Reorganization of the FEM1D Code

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Exercise

- refactor the code by creating a separate class template describing the FEM problem
- template parameter defining the type of real numbers:

```
template<class prec = double>
fem_1d { ... }
```

- constructor with one argument defining the mesh, store the mesh as a unique_ptr

```
fem_1d problem (std::unique_ptr<mesh>(new mesh (...)));
```

- methods to set coefficients

```
auto diff   = [](auto x) { return x * x; };
auto source = [](auto x) { return x * x * x; };
problem.set_diffusion_coefficient (diff);
problem.set_source_coefficient (source);
```

- fem_1d::assemble () method
- fem_1d::solve () method
- methods to set BCs

```
problem.set_dirichlet (fem_1d::left_boundary, 1);
problem.set_dirichlet (fem_1d::right_boundary, 0);
```

- methods to access assembled arrays

```
auto & A = problem.matrix ();
auto & b = problem.rhs ();
auto & c = problem.result ();
```