```
x = torch.linspace(-pi, pi, 801, dtype=torch.float64,
                   requires_grad=True)
y = torch.sin(x)
g, = torch.autograd.grad(y.sum(), x)
```

The automatic-differentiation primitive implements the local derivative rule. Composition of these local rules is justified by the chain-rule proof in the preceding questions.

Structural or analytic derivation

An independent analytic check is available from $\sin z = (e^{iz} - e^{-iz})/(2i)$: its derivative is $(e^{iz} + e^{-iz})/2$. This identity is used only to check the automatic output. A complex-step diagnostic computes $\operatorname{Im} \sin(x + ih)/h$; its Taylor expansion differs from the exact derivative by $O(h^2)$, so it is not an exact replacement for the requested automatic differentiation.

Comparative cost and preferred method

For m independent points, both automatic evaluation and direct primitive differentiation cost $\Theta(m)$ and produce m values. The recorded error is a numerical diagnostic, not a proof of the library implementation. Complex-step uses one complex evaluation per point and has a nonzero truncation term. Automatic differentiation satisfies the source requirement and is retained as the principal method.