1.3.4. The formulas

$$f(x)=\frac{1-\cos(x)}{\sin(x)}, \qquad g(x)=\frac{2\sin^2(x/2)}{\sin(x)}$$

are mathematically identical, but they suggest algorithms that can behave quite differently in floating point.

(a) Using (1.2.6), find the relative condition numbers of f and g. Show that they are identical either by applying trigonometric identities, or by plotting them over $x \in [-1,1]$.

(b) (MATLAB) Set

```
format long e
```

Compute $f(10^{-6})$ as a sequence of four elementary operations. Using Table 1.1, make a table like that in Example 1.3.3 that shows the result of each elementary step and the numerical value of the condition number of that step.

(c) (MATLAB) Repeat part (b) for $g(10^{-6})$. (There are six elementary steps.)

(d) Based on (b) and (c), which of the results is more accurate?