

The goal of this exercise is to compute the limit $\lim_{h \rightarrow 0} \frac{\cos h - 1}{h}$ that we will need in class to compute the derivatives of trigonometric function. Moreover, since limits are so fundamental, It is a good opportunity to review them.

1. What is $\lim_{h \rightarrow 0} \frac{\sin h}{h}$? (We have computed it in a previous section and it is an important limit to know).

2. One of the trigonometric identities for the half-angle is $\sin^2(t/2) = \frac{1}{2}(1 - \cos t)$ or equivalently, $\cos t = 1 - 2\sin^2(t/2)$.

How could this identity be used to compute the limit $\lim_{h \rightarrow 0} \frac{\cos h - 1}{h}$? Explain in words.

3. We now want to compute the limit $\lim_{h \rightarrow 0} \frac{-\sin^2(h/2)}{(h/2)}$. Compute this limit using part 1 and limit laws. What limit laws have you used?