

Problem 1

In each of Problems 1 through 4, write the given expression as a product of two trigonometric functions of different frequencies.

$$\cos 9t - \cos 7t$$

Solution

Recall the sum-to-product formula,

$$\cos u - \cos v = -2 \sin \left(\frac{u+v}{2} \right) \sin \left(\frac{u-v}{2} \right).$$

Using this, the given expression becomes

$$\begin{aligned} \cos 9t - \cos 7t &= -2 \sin \left(\frac{9t+7t}{2} \right) \sin \left(\frac{9t-7t}{2} \right) \\ &= -2 \sin 8t \sin t. \end{aligned}$$