# Exercise 14

Given that $\lim_{x\to 2}(5x-7)=3$, illustrate Definition 2 by finding values of $\delta$ that correspond to $\varepsilon=0.1$, $\varepsilon=0.05$, and $\varepsilon=0.01$.

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**Solution**

According to Definition 2, this limit is equivalent to

$$\text{if} \quad |x-2|<\delta \qquad \text{then} \qquad |(5x-7)-3|<\varepsilon$$

for all positive $\varepsilon$. We're looking for a number $\delta$ that's greater than $|x-2|$.

$$|(5x-7)-3|<\varepsilon$$

$$|5x-10|<\varepsilon$$

$$|5(x-2)|<\varepsilon$$

$$5|x-2|<\varepsilon$$

$$|x-2|<\frac{\varepsilon}{5}$$

If $\varepsilon=0.1$, then choose

$$\delta=\frac{\varepsilon}{5}=\frac{0.1}{5}=0.02.$$

If $\varepsilon=0.05$, then choose

$$\delta=\frac{\varepsilon}{5}=\frac{0.05}{5}=0.01.$$

If $\varepsilon=0.01$, then choose

$$\delta=\frac{\varepsilon}{5}=\frac{0.01}{5}=0.002.$$