Exercise 1 *Find*

$$\lim_{x\to 0}\left(x\sin\left(\frac{1}{x}\right)\right) = \boxed{0}.$$

Hint: *Notice that* $-x \le x\sin(\frac{1}{x}) \le x$ *for all* $x > 0$ *(emphatically,* $x \neq 0$*) and* $x \le x\sin(\frac{1}{x}) \le -x$ *for all* $x < 0$ *(again, emphatically,* $x \neq 0$*). This can be restated as* $-|x| \le x\sin(\frac{1}{x}) \le |x|$ *for* $x \neq 0$*. Our statement follows because* $-1 \le \sin(\frac{1}{x}) \le 1$ *for all* $x \neq 0$*, hence, we obtained our inequality by multiplying by* x*. Apply the Squeeze Theorem to the inequality.*

Hint: *We see that* $\lim_{x\to 0}(-x) = \lim_{x\to 0}(x) = 0$*. It follows, by the Squeeze Theorem, that* $\lim_{x\to 0}\left(x\sin(\frac{1}{x})\right) = 0$*.*