Limit Laws and Continuity

We will explore applications of limit laws.

General Directions: Answer each question thoroughly. Incorrect answers with work shown may receive partial credit, but unsubstantiated answers will receive NO CREDIT. I do not want (decimal) approximations unless specifically asked for. I want the exact numbers. Justify all claims using calculus concepts (i.e., theorems, definitions, etc.). I am looking for mathematical logic and reasoning. Show all of your work!! Explain! Explain! Explain!

1. If $f(x)$ is a polynomial function, then compute $\lim_{x \to 0} x \cdot f(x)$.

2. If $f(x)$ is a continuous function, then compute $\lim_{x \to 0} x \cdot f(x)$.

3. Create a function $f(x)$ such that $\lim_{x \to 0} x \cdot f(x) \neq 0$.