1. If \( f(x) = \frac{1}{x^2} \) find \( f'(x) \) directly from the definition of derivative.

2. Let \( f(x) = \begin{cases} x^2 & x \in \mathbb{Q} \\ 0 & x \in \mathbb{Q}^c \end{cases} \). Show that \( f \) is differentiable at \( x = 0 \) and find \( f'(0) \).

3. Let 
\[ f_s(x) = \lim_{h \to 0} \frac{f(x + h) - f(x - h)}{2h} \]
(sometimes called the symmetric derivative of \( f \) at \( x \)).

a) If \( f \) is differentiable at \( x \) show that \( f'(x) = f'_s(x) \).

b) Show by example that \( f'_s(x) \) may exist even if \( f \) is not differentiable at \( x \).