(Q8)
(a) True.

Proof. From the limit definition of the derivative:

$$\begin{aligned}\frac{d}{dx}(f(x)-g(x)) &= \lim_{x\to a}\frac{(f(x)-g(x))-(f(a)-g(a))}{x-a} \\ &= \lim_{x\to a}\frac{f(x)-f(a)-g(x)+g(a)}{x-a} \\ &= \lim_{x\to a}\frac{f(x)-f(a)}{x-a}+\lim_{x\to a}\frac{g(x)-g(a)}{x-a}\end{aligned}$$

Therefore, since the limit of $(f-g)$ exists, these limits, which are the derivatives of f and g, have to exist, and thus f and g are differentiable. ■

(b) False.
As a counterexample, consider $f(x) = 1$, and $g(x) = |x|$. It follows:

$$\frac{f(x)}{g(x)} = \frac{1}{|x|}$$

Which is differentiable on its domain. Furthermore, f is differentiable on its domain, but g is not.
(c) False.
As a counterexample, consider the function:

$$f(x) = \begin{cases} 0 \text{ if } x \in \mathbb{Q} \\ 1 \text{ if } x \notin \mathbb{Q} \end{cases}$$

$f \circ f$ is differentiable, but f is not.
(d) True.

Proof. Since f is differentiable, this implies f is continuous. Since continuity is preserved across composition (provied both functions are continuous), $f \circ f$ is continuous. ■