(Q9)
(a) True.

Proof. We observe that:

$$\begin{aligned} f + 2g &= 2g + f \\ &= 2g - 2f + 3f \\ &= 2(g - f) + 3f \end{aligned}$$

Since $f + 2g$ can be expressed as a combination and transformation of two integrable functions, it is also integrable. ■

(b) False.
As a counterexample, let $f = g = \chi_{\mathbb{Q}}$, where

$$\chi_{\mathbb{Q}}(x) = \begin{cases} 1 : x \in \mathbb{Q} \\ 0 : x \notin \mathbb{Q} \end{cases}$$

Neither f nor g are integrable, while $(f \circ g)(x) = 1$, which is integrable.
(c) False.
Let $\chi_{\mathbb{Q}}$ be the same as the one defined in (b). We define f as:

$$f(x) = \begin{cases} x^2 : x \in [-2, 0] \cup [1, 6] \\ \chi_{\mathbb{Q}} : x \in (0, 1) \end{cases}$$

f is integrable on $[-2, 0]$ and $[1, 6]$ but not on $(0, 1)$, so it is not integrable on $[-1, 4]$.
(d) False.
Let f be defined as:

$$f(x) = \begin{cases} 1 : x \in \mathbb{Q} \\ -1 : x \notin \mathbb{Q} \end{cases}$$

$f^2(x) = 1$, which is integrable, while f is not.