6. [7 points] The derivative of a continuous function \( g \) is given by

\[
g'(x) = \frac{e^{-2x}(x + 2)(x - 3)^2}{(x - 5)^{1/3}}.
\]

Determine all critical points of \( g \), and classify each as a local maximum, a local minimum, or neither. Carefully explain your reasoning for each classification.

**Solution:** Since we are already given the derivative of a continuous function, we need only find out where the derivative is zero or undefined. Since the factor \( e^{-2x} \) is positive for all \( x \), the derivative is equal to zero at \( x = -2, 3 \) and undefined at \( x = 5 \). Applying the first derivative test around \( x = -2 \), we can use the equation to determined that \( g' \) changes sign from positive to negative around \( x = -2 \). Thus, \( x = -2 \) is a local maximum. Around \( x = 3 \), we find that \( g' < 0 \) both to the left and right of \( x = 3 \), so the critical point \( x = 3 \) is neither a local maximum or minimum. Lastly, around \( x = 5 \), the derivative changes sign from negative to positive. Thus, \( g \) has a local minimum at \( x = 5 \).

7. [8 points] Use the following figure, which shows a graph of \( f(x) \), to find each of the indicated integrals, given that the first area (with the darker shading) is 12 units and the second area is (with the lighter shading) is 3 units.

![Figure](image_url)  

(a) \( \int_a^b f(x) \, dx \) _________ 12  
(b) \( \int_b^c |f(x)| \, dx \) _________ 15  
(c) \( \int_c^a f(x) \, dx \) _________ 9  
(d) \( \int_a^a 2(f(x) + 3) \, dx \) _________ 0

(1)