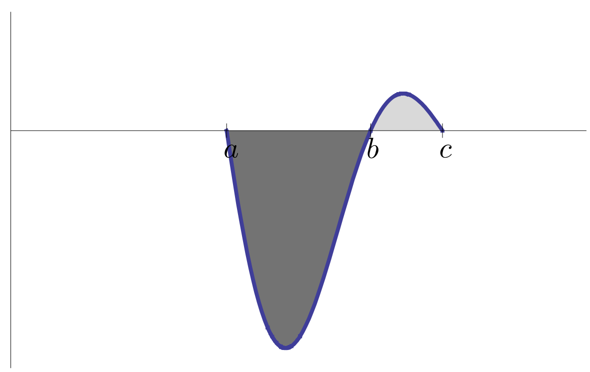
6. [7 points] The derivative of a continuous function g is given by

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

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.



(a) $\int_a^b f(x)\,dx$ $\underline{\quad -12 \quad}$

(b) $\int_a^c |f(x)|\,dx$ $\underline{\quad 15 \quad}$

(c) $\int_c^a f(x)\,dx$ $\underline{\quad 9 \quad}$

(d) $\int_a^a 2(f(x)+3)\,dx$ $\underline{\quad 0 \quad}$

(1)