1. [13 points] Given below is a table of values for a function $f(x)$ and its derivative $f'(x)$. The functions $f(x)$, $f'(x)$, and $f''(x)$ are all defined and continuous on $(-\infty, \infty)$.

x	0	2	4	6	8	10	12
$f(x)$	15	12	11	7	-2	3	5
$f'(x)$	-3	0	-2	-4	0	2	6

Assume that between consecutive values of x given in the table above, $f(x)$ is either **always increasing** or **always decreasing**.

In **a.**–**d.**, find the numerical value **exactly**, or write NEI if there is not enough information provided to do so. You do not need to simplify your numerical answers. *You do not need to show work on this page, but limited partial credit may be awarded for work shown.*

a. [2 points] Find $\lim_{s \to 0} \dfrac{f(4+s) - f(4)}{s}$.

Answer: _____

b. [2 points] If $B(x) = x^3 f(x)$, find $B'(10)$.

Answer: _____

c. [2 points] Find $\displaystyle\int_4^8 f'(x)\ dx$.

Answer: _____

d. [2 points] Find $\displaystyle\int_0^{10} \left(5f''(x) - 3x^2\right)\ dx$.

Answer: _____

This problem continues on the next page.

This problem continues from the previous page. The problem statement is repeated for convenience.

Given below is a table of values for a function $f(x)$ and its derivative $f'(x)$. The functions $f(x)$, $f'(x)$, and $f''(x)$ are all defined and continuous on $(-\infty, \infty)$.

x	0	2	4	6	8	10	12
$f(x)$	15	12	11	7	-2	3	5
$f'(x)$	-3	0	-2	-4	0	2	6

Assume that between consecutive values of x given in the table above, $f(x)$ is either **always increasing** or **always decreasing**.

e. [2 points] Use a right Riemann sum with four equal subdivisions to estimate $\int_0^8 f(x)\,dx$. Write out all the terms in your sum. Your answer should not include the letter f, but you do not need to simplify.

f. [1 point] Does the answer to part **e.** overestimate, underestimate, or equal the value of $\int_0^8 f(x)\,dx$? Circle your answer. If there is not enough information to decide, circle NEI.

Answer: OVERESTIMATE UNDERESTIMATE EQUAL NEI

g. [2 points] Use a left Riemann sum with two equal subdivisions to estimate $\int_2^8 xf(2x)\,dx$. Write out all the terms in your sum. Your answer should not include the letter f, but you do not need to simplify.