1. [14 points] Given below is a table of some values of the **even** function $k(x)$, along with its derivative $k'(x)$. Assume the functions $k(x)$, $k'(x)$, and $k''(x)$ are continuous on $(-\infty, \infty)$, and that $k(x)$ is decreasing on $(0, \infty)$. Your final answers in this problem should not include the letter k.

x	0	1	2	3	4	5
$k(x)$	12	8	7	2	0	-3
$k'(x)$	0	-3	-4	-2	-1	-5

In parts **a.**–**c.**, find the numerical value **exactly**, or write NEI if there is not enough information provided to do so. *Show your work. Limited partial credit may be awarded for work shown.*

a. [2 points] Find $\displaystyle\int_1^3 \left(2k'(x) + e^x\right) dx$.

Answer: _____

b. [2 points] Find the average value of $k''(x)$ on the interval $[1, 4]$.

Answer: _____

c. [2 points] Find $\displaystyle\lim_{h\to 0} k(-1) + \lim_{h\to 0} \frac{k(3+h) - k(3)}{h}$.

Answer: _____

d. [2 points] Use the table to estimate $k''(4.5)$.

Answer: _____

This problem continues on the next page.

This problem continues from the previous page. The table of some values of the even function $k(x)$ and its derivative $k'(x)$ is displayed again for convenience. Recall that $k(x)$, $k'(x)$, and $k''(x)$ are continuous on $(-\infty, \infty)$, and $k(x)$ is decreasing on $(0, \infty)$. Your final answers in this problem should not include the letter k.

x	0	1	2	3	4	5
$k(x)$	12	8	7	2	0	-3
$k'(x)$	0	-3	-4	-2	-1	-5

e. [2 points] Find the linear approximation $L(x)$ of the function $j(x) = 3k(2x) + 1$ at the point $x = 2$.

Answer: $L(x) =$ _____

f. [2 points] Use a right-hand Riemann sum with two equal subdivisions to estimate $\displaystyle\int_1^5 k(x)\,dx$. Write out all the terms in your sum, which you do not need to simplify.

g. [2 points] Does the sum described in part **f**. *overestimate*, *underestimate*, or *equal* the value of

$$\int_1^5 k(x)\,dx?$$

Circle your answer and provide a brief explanation. If there is not enough information to decide, circle NEI.

Circle one: OVERESTIMATE UNDERESTIMATE EQUAL NEI

Explanation: