3. (3 points) Fill in the missing information to show that the given definite integral can be expressed as the limit of a Riemann sum. The only variables appearing in your limit should be \( n \) and \( k \). You do not need to evaluate this limit.

\[
\int_{-2}^{7} \left( x^3 - \frac{2}{x - 12} \right) \, dx = \lim_{n \to \infty} \sum_{k=1}^{n} \left[ \frac{\Delta x}{n} \left( -2 + \frac{\Delta x}{n} \right)^3 - \frac{2}{n} \left( -2 + \frac{\Delta x}{n} \right) - 12 \right]
\]

\[\Delta x = \frac{7 - (-2)}{n} = \frac{9}{n}\]

\[x_k = -2 + \frac{9}{n} k\]

area of rectangle \(\Delta x \cdot f(x_k)\)

4. (3 points) The students in my calculus class begin eating waffles at 1:00 pm at a rate of \(e^{-t}\), where \(t\) is the number of hours since 1:00 pm. How many waffles did my students eat from 2:00 pm to 3:00 pm. Simplify your answer as much as possible without a calculator.

\[
\begin{align*}
1 \text{pm} & : t = 0 & 2 \text{pm} & : t = 1 & 3 \text{pm} & : t = 2 \\
\int^{2}_{1} e^{-t} \, dt &= \left[ -e^{-t} \right]^{2}_{1} \\
&= -e^{-2} - (-e^{-1}) = \boxed{\frac{e^{-1} - e^{-2}}{e^{1} - e^{2}}} \text{ waffles}
\end{align*}
\]
1. (2 points) Suppose \( g \) is even and is integrable on the interval \([-7, 7]\). Given the following integrals, what is the value of \( \int_{-2}^{2} f(x) \, dx \)

\[
\begin{align*}
\int_{-2}^{2} f(x) \, dx &= 3 \\
\int_{-7}^{7} f(x) \, dx &= 3 \\
\int_{-5}^{5} f(x) \, dx &= 6 \\
\int_{0}^{5} f(x) \, dx &= 12
\end{align*}
\]

Even \( \Rightarrow \)

\[
\begin{align*}
\int_{-7}^{7} f(x) \, dx &= 2 \int_{0}^{7} f(x) \, dx = 6 \\
\int_{0}^{5} f(x) \, dx &= 12
\end{align*}
\]

\[
\begin{align*}
\int_{0}^{5} f(x) \, dx &= \int_{0}^{2} f(x) \, dx - \int_{0}^{2} f(x) \, dx \\
&= \int_{0}^{7} f(x) \, dx - \left[ \int_{0}^{7} f(x) \, dx - \int_{0}^{2} f(x) \, dx \right] = 12 - \left[ 6 - \frac{3}{2} \right] \\
&= 9
\end{align*}
\]

2. (2 points) Evaluate the indefinite integral \( \int \left( \frac{e}{x} + \csc x \cot x \right) \, dx \)

\[
\begin{align*}
\int \frac{e}{x} \, dx + \int \csc x \cot x \, dx \\
\ln |x| + (- \csc x) + C
\end{align*}
\]