Problem:

The random variable X is uniformly distributed on the segment $[-4,2]$. Find $E(e^{4X})$.

Solution:

X is uniformly distributed on $[-4,2] \Rightarrow$ the probability density will be

$$f(x) = \begin{cases} \dfrac{1}{2-(-4)}, & -4 \le x \le 2 \\ 0, & x \notin [-4;2] \end{cases} = \begin{cases} \dfrac{1}{6}, & x \in [-4;2] \\ 0, & x \notin [-4;2] \end{cases}, \qquad Y = e^{4X} = g(X), \qquad \text{where } g(t) = e^{4t}$$

$\Rightarrow$ for the expected value of $Y = g(X)$ we have the formula

$$E(e^{4X}) = \int\limits_{-\infty}^{+\infty} g(x) \cdot f(x)dx = \int\limits_{-4}^{2} e^{4x} \cdot \frac{1}{6}dx = \frac{e^{4x}}{4 \cdot 6}\Bigg|_{-4}^{2} = \frac{1}{24}(e^8 - e^{-16}) \Rightarrow \boxed{E(e^{4X}) = \frac{e^8 - e^{-16}}{24}}.$$