Question:

Identify the maximum and minimum values of the function y = 8 cos x in the interval [-2π, 2π]. Use your understanding of transformations, not your graphing calculator.

Solution (I way):

As we know the maximum and minimum values of the function y = cos x in the interval [-2π, 2π] are M=1 and m=-1 respectively.

Hence,

$$\max_{x \in [-2\pi, 2\pi]} y = \max_{x \in [-2\pi, 2\pi]} 8 \cos x = 8 * \max_{x \in [-2\pi, 2\pi]} \cos x = 8 * 1 = 8$$

and

$$\min_{x \in [-2\pi, 2\pi]} y = \min_{x \in [-2\pi, 2\pi]} 8 \cos x = 8 * \min_{x \in [-2\pi, 2\pi]} \cos x = 8 * (-1) = -8$$

Solution (II way):

As we know the maximum and minimum values of the function y = cos x in the interval [-2π, 2π] are 1 and -1 respectively. Since, graph of y = 8 cos x is vertical stretch by a factor of 8 units, of graph y=cos x, so the maximum and minimum values of the function y = cos x in the interval [-2π, 2π] are 8 and -8 respectively.

Answer: $\max\limits_{x \in [-2\pi, 2\pi]} y = 8$, $\min\limits_{x \in [-2\pi, 2\pi]} y = -8.$