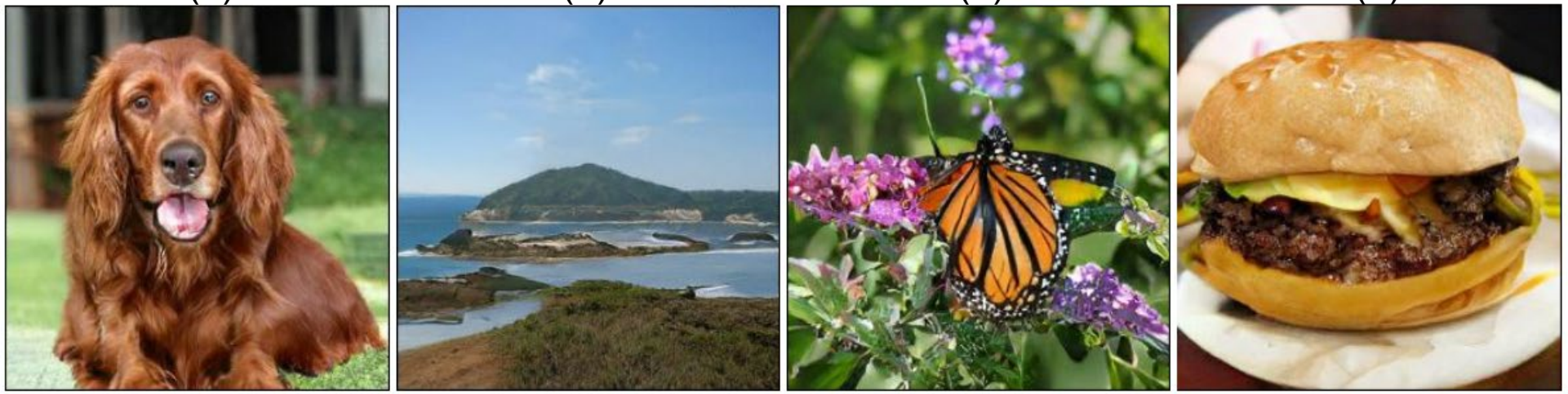
# A Fun Quiz

Let us look at the following images. Some of them are generated by an AI model. Which one do you think is a *real image*?

(1) (2) (3) (4)



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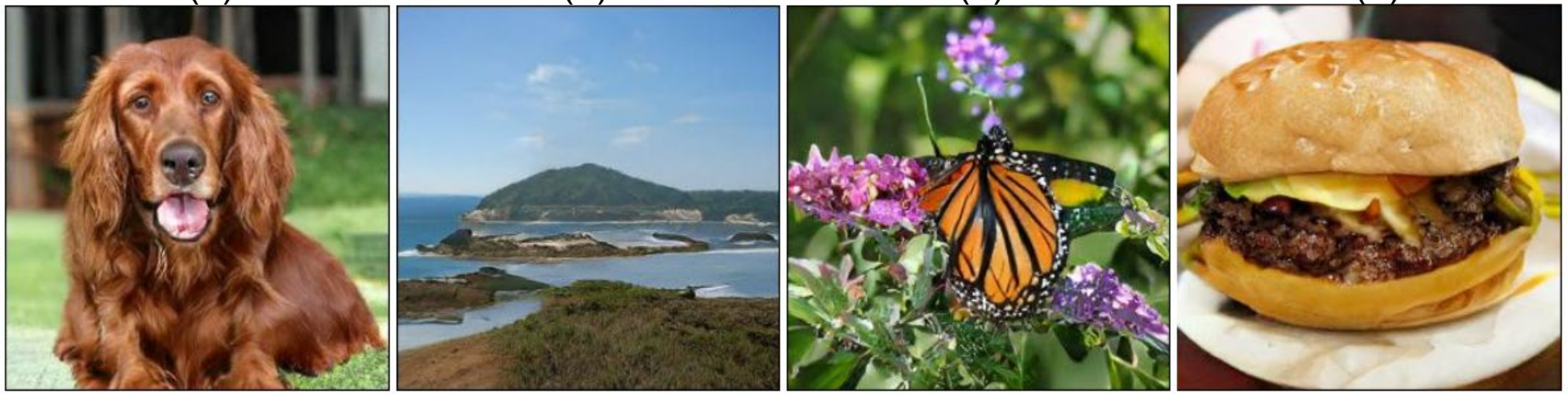

A. (1)
B. (2)
C. (3)
D. (4)

Answer: None. They are all generated by AI ;)

# Gradient Descent

Consider the function $y = (x^2 + 1) \cdot w$. What's the derivative/gradient for x?

A. $w \cdot 2\mathrm{x}$
B. $w \cdot \mathrm{x}$
C. $2\mathrm{x}$
D. $w$

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Answer: A.

Let $y = h(x) \cdot w = (x^2 + 1) \cdot w$ where $h(x) = (x^2 + 1)$. According to the chain rule,

$$\frac{\partial y}{\partial x} = \frac{\partial y}{\partial h} \cdot \frac{\partial h}{\partial x} = w \cdot 2x.$$

# Linear Perceptron

Consider the linear perceptron with x as the input. Which function can the linear perceptron compute?

$(1)\ y = \mathrm{ax} + \mathrm{b}$

$(2)\ y = \mathrm{ax}^2 + bx + c$

A. $(1)$
B. $(2)$
C. $(1)(2)$
D. None of the above

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D. None of the above

Answer: A. All units in a linear perceptron are linear. Thus, the model can not present non-linear functions.

# Linear Perceptron: Learning

Consider using a linear perceptron for regression given a training dataset. If we use gradient descent for learning the weights of the model and start from the same initial weights, what will happen if we increase the learning rate (within a reasonable range)?

A. The model will always take less steps to converge.
B. The model might not converge at all.
C. The model will always converge, but might converge to different solutions.
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Answer: D. This is the same as linear regression (a convex optimization problem)

# Perceptron

Perceptron can be used for:

A. classification
B. regression
C. both classification and regression

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Answer: C. Perceptron can be used in both tasks by using different activation functions.