# Derivatives of sine and cosine, part 2

MTH 201 -- Module 4B

d. Determine the derivative of $p(z) = z^4 + 4^z + 4\cos(z) - \sin(\frac{\pi}{2})$.

e. The function $P(t) = 24 + 8\sin(t)$ represents a population of a particular kind of animal that lives on a small island, where $P$ is measured in hundreds and $t$ is measured in decades since January 1, 2010. What is the instantaneous rate of change of $P$ on January 1, 2030? What are the units of this quantity? Write a sentence in everyday language that explains how the population is behaving at this point in time.

The derivative of $p(z) = z^4 + 4^z + 4\cos(z) - \sin\left(\frac{\pi}{2}\right)$ is...

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The instantaneous rate of change in $P(t) = 24 + 8\sin(t)$ on January 1, 2030 is... (include the units)

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# The previous answer ($P'(2) \approx -3.3$) means that...

- After 2 decades, the population has decreased by 3.3 animals
- After 2 decades, the population has decreased by 330 animals
- After 2 decades, the population is decreasing at a rate of 3.3 animals per year
- After 2 decades, the population is decreasing at a rate of 330 animals per year
- None of the above

**1.** Suppose that $V(t) = 24 \cdot 1.07^t + 6\sin(t)$ represents the value of a person's investment portfolio in thousands of dollars in year $t$, where $t = 0$ corresponds to January 1, 2010.

a. At what instantaneous rate is the portfolio's value changing on January 1, 2012? Include units on your answer.

b. Determine the value of $V''(2)$. What are the units on this quantity and what does it tell you about how the portfolio's value is changing?

# Feedback/questions

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