MATHEMATICS · GRADES 10-12

Constant rule

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you know a flat, unchanging quantity has no rate of change at all. A fixed monthly fee never goes up or down no matter how much time passes, so its rate of change is zero. It sounds obvious, but it is the rule that lets you ignore the constant parts of a problem and focus on the parts that actually change.



Rule

Constant rule: the derivative of a constant is 0.

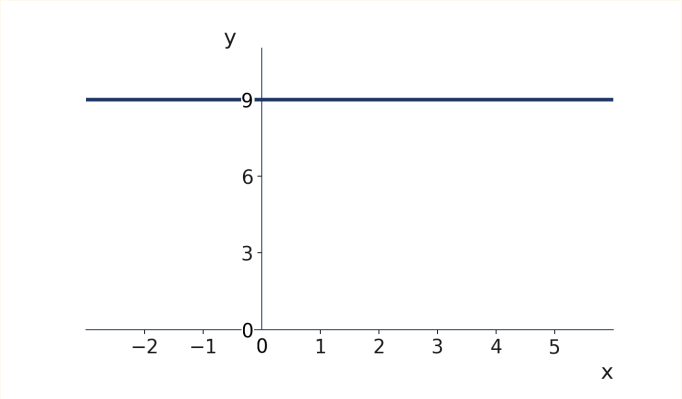
A constant never changes, so its rate of change is zero. Its graph is a horizontal line, and a horizontal line has slope 0.

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Worked examples

EXAMPLE 1

Q Differentiate f(x) = 9.



SOLUTION

9 is a constant, so it never changes.

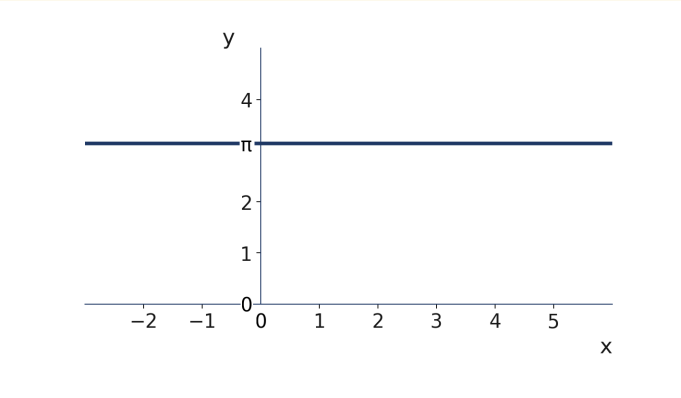
A quantity that never changes has no rate of change, so its derivative is 0.

So f'(x) = 0

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EXAMPLE 2

Q Differentiate f(x) = pi.



SOLUTION

Pi is a constant number, about 3.14.

A constant never changes, so its rate of change is 0.

So its derivative is 0

Practice questions

1 **What is the derivative of 4?**

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2 What is the derivative of 2^3?

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3 What is the derivative of 0?

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4 If $f(x) = 6$, what is $f'(x)$?

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5 Why is the derivative of a constant 0?

- **A** A constant is always zero, so its derivative is zero
- **B** A constant does not change, so its rate of change is 0
- **C** A constant grows slowly, so its rate of change is small but not zero
- **D** A constant changes with time, so its derivative is 1

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6 What is the derivative of 1/2?

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7 In $x^2 + 8$, what is the derivative of the constant part, 8?

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8 What is the derivative of the square root of 2?

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9 A road is perfectly flat. What is its slope?

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10 A parking fee is a flat 12 dollars, the same no matter how long you stay. What is the rate of change of the fee with respect to time?

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ANSWER KEY

1. 0

2. 0

3. 0

4. 0

5. A constant does not change, so its rate of change is 0

6. 0

7. 0

8. 0

9. 0

10. 0

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