MATHEMATICS · GRADES 10-12

Power rule

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you find how fast something is changing, like how quickly a ball speeds up as it falls or how fast a population grows. A ball falls faster every second, and a town growing by a percentage each year grows faster as it gets bigger. A speedometer reading, a water level rising in a tank, and a rumour spreading through a school are all rates of change. This rule is the tool that turns a changing quantity into a number for how fast it is changing.



Rule

To differentiate x^n, bring the power down in front and reduce the power by one.

The derivative of x^n is $n \times x^{(n - 1)}$.

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Worked examples

EXAMPLE 1

Q Differentiate x^5.

SOLUTION

Power rule: bring the power down in front.

Multiply by the power: $5 \times x^4$.

So the answer is $5x^4$.

EXAMPLE 2

Q Differentiate x^3.

SOLUTION

Bring the 3 down: $3 \times x^2$.

That is the whole rule.

So the answer is $3x^2$.

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Practice questions

1 Differentiate x^2.

- **A** x^2
- **B** $2x$
- **C** 2
- **D** x

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2 Differentiate x^4.

- **A** x^3
- **B** $4x^4$
- **C** $4x^3$
- **D** $3x^4$

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3 **Differentiate x.**

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4 **Differentiate x^{10}.**

A $9x^{10}$

B $10x^{9}$

C $10x^{10}$

D x^{9}

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5 Which formula is the power rule?

A $d/dx\ x^n = n\ x^{(n-1)}$

B $d/dx\ x^n = x^{n-1}$

C $d/dx\ x^n = n\ x^n$

D $d/dx\ x^n = (n - 1)\ x^n$

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6 Differentiate x^7.

A $6x^7$

B $7x^7$

C $7x^6$

D x^6

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7 Differentiate $2x^3$.

A $6x^2$

B $2x^2$

C $6x^3$

D $3x^2$

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8 Differentiate $6x$.

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9 Differentiate $5x^2$.

- **A** $5x$
- **B** $10x^2$
- **C** $2x$
- **D** $10x$

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10 Differentiate x^6.

- **A** $5x^6$
- **B** $6x^6$
- **C** $6x^5$
- **D** x^5

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ANSWER KEY

1. $2x$

2. $4x^3$

3. 1

4. $10x^9$

5. $d/dx\ x^n = n\ x^{(n-1)}$

6. $7x^6$

7. $6x^2$

8. 6

9. $10x$

10. $6x^5$

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