LESSON MAKER PRO

Derivative Replay

Find second and higher-order derivatives.

HIGH SCHOOL · MA.912.C.2.7

MA.912.C.2.7 "Find second derivatives and derivatives of higher order."

NAME _____ DATE _____

DIFFERENTIATE AGAIN

The second derivative is the derivative of the first derivative. To find higher-order derivatives, keep differentiating one derivative at a time, using the power rule and remembering that constants differentiate to 0.

WORKED EXAMPLE

Find f''(x) for f(x)=19x^20-23x^16+29.

1. f'(x)=380x^19-368x^15.
2. f''(x)=7220x^18-5520x^14.

Answer: f''(x)=7220x^18-5520x^14

PRACTICE 6 problems

1 Find f''(x) for f(x)=3x^4-7x^2+1.

ANSWER _____

2 Find f'''(x) for f(x)=x^7-2x^5.

ANSWER _____

3 Find f''(x) for f(x)=7/x^3+x.

ANSWER _____

4 Find f''(x) for f(x)=2x^6-x^3.

ANSWER _____

5 Find f'''(x) for f(x)=12x^4+15x^2.

ANSWER _____

6 Find f''''(x) for f(x)=x^9-6x^2.

ANSWER _____

APPLY IT Show your work

1 A skateboarder's distance, in meters, after x seconds is s(x)=2x^3+7x^2-x. Find the skateboarder's acceleration when x=3.

WORK SPACE

ANSWER _____

2 A coding club models a virtual race car's position, in meters, with p(x)=x^4-7x^3+2x, where x is time in seconds. Find the car's jerk when x=4. Jerk is p'''(x).

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

For q(x)=3x^7-2x^4+x, find q''''(x). Then explain why the x term does not appear in your result.

_____

_____

ANSWER KEY

Derivative Replay

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find f''(x) for f(x)=3x^4-7x^2+1.	**f''(x)=36x^2-14**
2	Find f'''(x) for f(x)=x^7-2x^5.	**f'''(x)=210x^4-120x^2**
3	Find f''(x) for f(x)=7/x^3+x.	**f''(x)=84/x^5**
4	Find f''(x) for f(x)=2x^6-x^3.	**f''(x)=60x^4-6x**
5	Find f'''(x) for f(x)=12x^4+15x^2.	**f'''(x)=288x**
6	Find f''''(x) for f(x)=x^9-6x^2.	**f''''(x)=3024x^5**

PART 2 · APPLY IT

1. **50 m/s^2** Differentiate twice to get s''(x)=12x+14. Substitute x=3 to get 50.
2. **54 m/s^3** Differentiate three times to get p'''(x)=24x-42. Substitute x=4 to get 54.

CHALLENGE

q''''(x)=2520x^3-48. The x term becomes 0 after its second derivative.

Accept equivalent forms, including 84x^-5 for 84/x^5. For the word problems, accept correctly stated equivalent acceleration and jerk units.