January 23

How are blow pops like the chain rule?

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Students will verbally explain how to find the derivative

(using the words:
function, exponent, coefficient…)

Chain Rule:

The derivative of the outside function

leaving the inside alone

times

the derivative of the inside function.

$$\frac{d}{dx}\left(f(g(x))\right) = f'(g(x))\,g'(x)$$

$f(x)$

$f'(x)$

Differentiation by the Chain Rule - Homework

Find the derivatives of the following:

1. $y = (3x-8)^4$
2. $y = (3x^2+2)^5$
3. $y = 4(x^2+x-1)^{10}$
4. $y = -5(4-9x)^{3/2}$
5. $y = \frac{1}{3x-2} = (3x-2)^{-1}$
6. $y = \frac{-1}{(x^2-5x-6)^2}$
7. $y = \left(\frac{2}{2-x}\right)^2$
8. $y = \frac{4x}{(x+1)^2}$
9. $y = \frac{-3}{(x^3-x^2+3)^3}$ $= -3(x^3-x^2+3)^{-3}$
10. $y = x^3(5x-1)^4$
11. $y = \sqrt{1-t}$
12. $y = \sqrt[3]{3x^3-4x+2}$
13. $y = \frac{2}{\sqrt{2x+3}}$
14. $y = \frac{-1}{\sqrt{x+1}}$
15. $y = \sqrt{\frac{3x}{2x-3}}$

16. $y = \sqrt{x}(1-2x)^2$ 17. $y = \sqrt[3]{\dfrac{2t}{t^2-4}}$ 18. $y = \left(x^2+2x-6\right)^2\left(1-x^3\right)^2$

For each of the following, find the equation of the tangent line at the indicated point. Verify by calculator.

19. $y = \sqrt{x^2+2x+8}$ at $(2,4)$ 20. $y = \sqrt[3]{3x^3+4x}$ at $(2,2)$ 21. $y = \sqrt{\dfrac{3x-1}{2x+1}}$ at $(-1,2)$

Given the following information, find the value of the derivative of the functions at $x = 3$. Be careful, not all the information is needed to calculate these. Answers are next to the problem.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
3	1	8	-3	-5
6	3	-2	4	5
8	-1	3	π	4
1	2	-6	5	0

22. $f(x)+g(x)$ (Ans: -8) 23. $f(x)g(x)$ (Ans: -29) 24. $\dfrac{f(x)}{g(x)}$ (Ans: $\dfrac{-19}{64}$)

25. $\dfrac{g(x)}{f(x)}$ (Ans: 19) 26. $\left(f(x)\right)^2$ (Ans: -6) 27. $\dfrac{1}{g(x)}$ (Ans: $\dfrac{5}{64}$)

28. $\sqrt{f(x)}$ (Ans: $\dfrac{-3}{2}$) 29. $\sqrt{f(x)+g(x)}$ (Ans: $\dfrac{-4}{3}$) 30 . $f^3(x)g(x)$ (Ans: -77)