



April 15

Find the derivatives of the following functions:

$$f(x) = 5x^5 + x^{-1}$$

$$f'(x) = 25x^4 + -1x^{-2}$$

$$g(x) = (x^3 - 7x)(x^2 + 8x + 9)$$

$$g'(x) = (3x^2 - 7)(x^2 + 8x + 9) + (2x + 8)(x^3 - 7x)$$

$$h(x) = \frac{2x^3}{4x - 10}$$

$$\frac{6x^2(4x - 10) - 4(2x^3)}{(4x - 10)^2}$$



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Students will verbally explain how to find the derivative using the chain rule

(using the words:
inside, outside, etc...)

Chain Rule

$$\frac{d}{dx}[f(g(x))] = f'(g(x)) \cdot g'(x)$$

The derivative of the outside function,
leaving the inside function alone,
times
the derivative of the inside function

$$f(x) = (4x^2 - 6x)^5$$



Function

$$(\quad)^5$$

Derivative

$$5(\quad)^4$$



$$4x^2 - 6x$$

$$4(2x) - 6$$
$$8x - 6$$

$$f'(x) = 5(4x^2 - 6x)^4 (8x - 6)$$
$$(40x - 30)(4x^2 - 6x)^4$$

$$f(x) = \frac{5}{(4x^7 - 6x)^3} = 5(4x^7 - 6x)^{-3}$$



Function

$$5(\quad)^{-3}$$

Derivative

$$-15(\quad)^{-4}$$



$$4x^7 - 6x$$

$$28x^6 - 6$$

$$f'(x) = -15(4x^7 - 6x)^{-4} (28x^6 - 6)$$

$$f(x) = \sqrt{2 + (7 - 6x + x^3)^2}$$



Function

$$\sqrt{\quad} = x^{1/2}$$

Derivative

$$\frac{1}{2} x^{-1/2}$$



$$2 + (\quad)^2$$

$$2(\quad)$$




$$7 - 6x + x^3$$

$$-6 + 3x^2$$

$$f'(x) = \frac{1}{2} (2 + (7 - 6x + x^3)^2)^{-1/2} 2(7 - 6x + x^3)(-6 + 3x^2)$$

$$f(x) = \sqrt{2 + (7 - 6x + x^3)^2}$$

Function Derivative



$$\sqrt{\quad} = (\quad)^{1/2} \quad \frac{1}{2} (\quad)^{-1/2}$$



$$2 + (\quad)^2 \quad 2(\quad)$$



$$7 - 6x + x^3 \quad -6 + 3x^2$$

$$f'(x) = \frac{1}{2} (2 + (7 - 6x + x^3)^2)^{-1/2} \cdot 2(7 - 6x + x^3)(-6 + 3x^2)$$

$$\frac{(7 - 6x + x^3)(-6 + 3x^2)}{\sqrt{2 + (7 - 6x + x^3)^2}}$$

$$f(x) = \sqrt[3]{\frac{4x+7}{2x-9}} = \left(\frac{4x+7}{2x-9}\right)^{1/3}$$

$$f'(x) = \frac{1}{3} \left(\frac{4x+7}{2x-9}\right)^{-2/3} \left(\frac{4(2x-9) - 2(4x+7)}{(2x-9)^2}\right)$$