The Chain Rule

ain Rule is a method used to find the derivative of a function that has other
n(s) inside itself (when you have the composition of functions).

$x^5 \rightarrow y' = 5x^4 \cdot 1$ $\quad D_x\left[f(g(x))\right] = f'(g(x))(g'(x))$

$(4x^5 + 2x^2)^5$

$y' = 5(4x^5 + 2x^2)^4(20x^4 + 4x)$

2) $y = (6x^3 + 5x)^6$

$y' = 6(6x^3 + 5x)^5(18$

$\sqrt{x^3 + 7} = (x^3 + 7)^{1/2}$

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

4) $y = \tan 6x$

$y' = \sec^2(6x) \cdot 6$

$\sin^4 x = (\sin x)^4$

$y' = 4(\sin^3 x) \cdot \cos x$

6) $f(x) = \sin($

$f'(x) = \cos(x^4) \cdot 4$

$x^2 \cdot x = x^3$

$(\sec(2$

$= \sqrt{\sin(6x)} = (\sin(6x))^{1/2}$

$y' = \frac{1}{2}(\sin(6x))^{-1/2} \cdot \cos(6x) \cdot 6$

$y' = 3(\sin(6x))^{-1/2} \cdot \cos(6x)$

8) $y = \sec^3(2$

$y' = 3(\sec^2(2x)) \cdot (\sec(2$

$y' = 6\sec^3(2x) \cdot \tan$

$x^6)(3x^2+x)^4$

10) $y=(3x^3+5)^3(4$

$0x^5(3x^2+x)^4+(5x^6)\cdot 4(3x^2+x)^3(6x+1)$

$x^5(3x^2+x)^4+20x^6(3x^2+x)^3(6x+1)$

$(3x^3+5)^2(9x^2)(4x^2+2x)+(3x^3+5)^3\cdot(8x+2)$

$7x^2(3x^3+5)^2(4x^2+2x)+(3x^3+5)^3\cdot(8x+2)$

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

12) $f(x) = (3x^5)\cos$

$$\frac{(\ldots+x)^{\cancel{4}\,2}\cdot 12x^3 - 3x^4\cdot 2\cancel{(6x^3+x)}(18x^2+1)}{((6x^3+x))^{\cancel{4}\,3}}$$

see in 2 slides

$$\frac{\ldots x^3(6x^3+x) - 6x^4(18x^2+1)}{(6x^3+x)^3}$$

$\tan^3 x \cot^4 x$

14) $k(x) = \dfrac{2x^4}{\cos^5 x}$

$\cancel{\tan^3}x \cdot \sec^2 x \cdot \cot^{\cancel{4}\,2} x + \cancel{\tan^3} x \cdot 4\cancel{\cot^3}x \cdot (-\csc^2 x)$

$\ldots\sec^2 x \cdot \cot^2 x - 4\csc^2 x$

$\dfrac{1}{\cancel{\cos^2}} \quad \dfrac{\cancel{\cos^2}}{\sin^2}$

$y' = 3\csc^2 x - 4\csc^2 x = -1\csc^2 x = \boxed{-\csc^2 x}$

$$= \frac{2}{(5x+1)^2}$$

$) = (3x^5)\cos^6 x$

$f'(x) = 15x^4 \cdot \cos^6 x + 3x^5 \cdot 6 \cdot \cos^5 x \cdot (-\sin x)$

$f'(x) = 15x^4 \cos^6 x - (18x^5)(\cos^5 x) \cdot (\sin x)$

14) $k(x) = \dfrac{2x^4}{\cos^5 x}$