2.4 The Chain Rule

- Find the derivative of a composite function using the Chain Rule.
- Find the derivative of a function using the General Power Rule.
- Simplify the derivative of a function using algebra.
- Find the derivative of a trigonometric function using the Chain Rule.

$\frac{-5}{2\sqrt{1-5x}}$

We've taken a lot of derivatives over the course of the last few sections. However, if you look back they have all been functions similar to the following kinds of functions.

(1) $y = \sqrt{1-5x}$

$y' = \frac{1}{2}(1-5x)^{-1/2}(-5)$

(2) $y = \tan(4x)$

$y' = \sec^2(4x) \cdot 4$

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

$y = (\sin x)^4$

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

(4) $y = \frac{2}{\sqrt{x^2+1}} = 2(x^2+1)^{-1/2}$

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

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

#1 $y = x(x^2+1)^4$

$y' = x \cdot 4(x^2+1)^3 \cdot 2x + (x^2+1)^4 \cdot 1$

$y' = 8x^2(x^2+1)^3 + (x^2+1)^4$

$y' = (x^2+1)^3(8x^2 + x^2 + 1)$

$y' = (x^2+1)^3(9x^2+1)$

#2 $y = \dfrac{x}{\sqrt{x^4+4}} = x(x^4+4)^{-1/2}$

$y' = x \cdot -\frac{1}{2}(x^4+4)^{-3/2} \cdot 4x^3 + (x^4+4)^{-1/2} \cdot 1$

$y' = -2x^4(x^4+4)^{-3/2} + (x^4+4)^{-1/2}$ $\quad -\frac{1}{2} - -\frac{3}{2} = 1$

$y' = (x^4+4)^{-3/2}(-2x^4 + x^4 + 4)$

$y' = \dfrac{4-x^4}{(x^4+4)^{3/2}}$

#3 $g(\theta) = \cos^2 8\theta = (\cos 8\theta)^2$

$g'(\theta) = 2(\cos 8\theta)^1(-\sin 8\theta \cdot 8)$

$= -16\cos 8\theta \sin 8\theta$

#4 $f(x) = \tan^5 2x = (\tan 2x)^5$

$f'(x) = 5(\tan 2x)^4 \sec^2 2x \cdot 2$

$= 10(\tan 2x)^4 \sec^2 2x$

#4 $f(x) = 4(x^2-2)^5$ find $f''(x)$

$f'(x) = 20(x^2-2)^4 \cdot 2x$

$f'(x) = 40x(x^2-2)^4$

$f''(x) = 40\left(x \cdot 4(x^2-2)^3 \cdot 2x + (x^2-2)^4 \cdot 1\right)$

$= 40\left(8x^2(x^2-2)^3 + (x^2-2)^4\right)$

$= 40\left((x^2-2)^3(8x^2 + x^2 - 2)\right)$

$= 40(x^2-2)^3(9x^2-2)$

p. 137

21 - 25 odd

57, 59, 73, 91

↑ Assigned on Friday