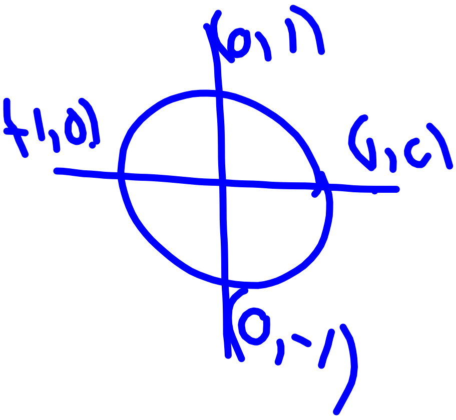
27

$f(x) = \cos x$

$$f'(x) = \frac{-\sin x}{-1} = \frac{0}{-1}$$



$\sin x = 0$

$x = \pi n, \ n \in \mathbb{Z}$

$g(x) = \sec x$

$g'(x) = \sec x \tan x = 0$

$\sec x = 0$

$\tan x = 0$

$\frac{1}{\cos x} = 0$

$x = \pi n, \ n \in \mathbb{Z}$

DNE

Test Tomorrow

Chapter #3

- Derivatives by limits

  $\lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$, $\lim_{x \to a} \frac{f(x)-f(a)}{x-a}$

- No Derivatives
  - ↳ Limits
  - ↳ Graphs
- Graphing
  - $f \to f'$
  - $f' \to f$
- Derivative Rules
- Applications
  - Vertical Tangent or Equations
  - Word problems
    - ↳ Area
    - ↳ $v(t)$, $a(t)$, $j(t)$
    - ↳ draining
    - ↳ economic
- Derivative of trig
  - ↳ Giving formulas for this
- Don't forget f'', f''', etc.

Section 4.1

Part #1

The Chain Rule

Review

Composite Functions:

If $f(x)=\sqrt{x}$ and $g(x)=x^2+1$ find $f\circ g(x)$

$f\circ g(x) = f(g(x)) = f(x^2+1)$

$= \sqrt{x^2+1}$

Find the derivative of the following.

$$y = (5x - 3)^2$$

$y = (5x-3)(5x-3)$

$y = 25x^2 - 30x + 9$

$y' = 50x - 30 = \frac{dy}{dx}$

OR

$y = (5x-3)(5x-3)$

$y' = (5x-3)\frac{d}{dx}(5x-3) + (5x-3)\frac{d}{dx}(5x-3)$

$= (5x-3)(5) + (5x-3)(5)$

$= 25x - 15 + 25x - 15$

$= 50x - 30$

Let's use a little substitution.

$y = (5x - 3)^2$ Find $\frac{dy}{dx}$

Let $u = 5x - 3$

$\frac{du}{dx} = (5)$

$y = u^2$

$\therefore$ So

$\frac{dy}{du} = 2u$

$\frac{dy}{du} \cdot \frac{du}{dx} = \frac{dy}{dx}$

$(10x-6)(5) = \frac{dy}{dx}$

$\frac{dy}{du} = 2(5x-3)$

$50x - 30 = \frac{dy}{dx}$

$\frac{dy}{du} = (10x - 6)$

$$(f \circ g)(x) = f(g(x))$$

$$(f \circ g)'(x) = f'(g(x)) \cdot g'(x)$$

OR

$$y = f(u), u = g(x)$$

$$y' = \frac{dy}{dx} = \frac{dy}{du}\left(\frac{du}{dx}\right)$$

$$y = (8x^2 - 3x)^{10}$$

Let $u = 8x^2 - 3x$

$$\frac{du}{dx} = 16x - 3$$

$$y = u^{10}$$

$$\frac{dy}{du} = 10u^9$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx} = 10u^9(16x-3)$$

$$= 10(8x^2-3x)^9(16x-3)$$

$$= 10(16x-3)(8x^2-3x)^9$$

$$y = \sin(x^3 + 1)$$

Let $u = x^3 + 1$ $\qquad y = \sin u$

$$\frac{du}{dx} = 3x^2 \qquad \frac{dy}{du} = \cos u$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

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

$$= 3x^2 \cos(x^3 + 1)$$

$$y = \sqrt{x^2 + 6x}$$

$u = x^2 + 6x$

$y = \sqrt{u} = u^{1/2}$

$\frac{du}{dx} = 2x + 6$

$\frac{dy}{du} = \frac{1}{2} u^{-1/2}$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

$$= \frac{1}{2} u^{-1/2} (2x+6)$$

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

$$= (x+3)(x^2+6x)^{-1/2}$$

$$= \frac{x+3}{\sqrt{x^2+6x}}$$

p. 158

#1-13

2. $-5\cos(7-5x)$

4. $(2-3x^2)\sec^2(2x-x^3)$

6. $\frac{10}{x^2}\csc^2\left(\frac{2}{x}\right)$

8. $\sec(\tan x)\tan(\tan x)\sec^2 x$

10. $4t\sin(\pi-4t)+\cos(\pi-4t)$

12. $\frac{3\pi}{2}\cos\frac{3\pi}{2}t-\frac{7\pi}{4}\sin\frac{7\pi}{4}t$