

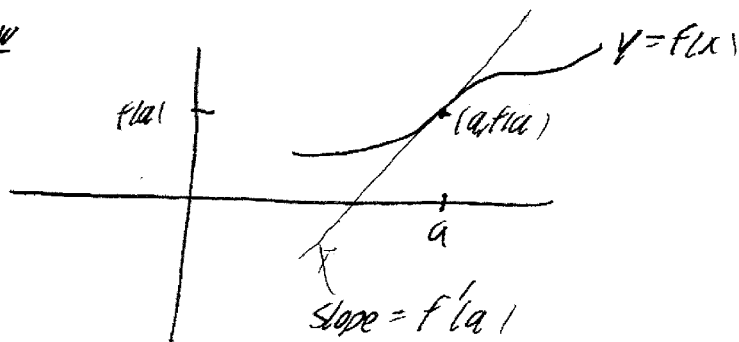
10/02/06

• go over quiz

n. 104 # 57, 58

n. 11 # 3, 4, 6, 30, 35,  
53

Review



Problem Find equation of tangent line to  $y=f(x)$  at  $x=a$ .

1. Plug  $a$  into  $f(x)$  to get point  $(a, f(a))$

2. Take derivative  $f'(x)$

3. Plug  $a$  into  $f'(x)$  to get slope  $f'(a)$ .

Final answer:

$$y - f(a) = f'(a)(x - a)$$

Only use limit def to find  $f'(x)$  if directed to a  
have no other technique available.

Example  $y = 3x^2 + \sqrt[3]{x}$  at  $x = -8$

Example At what  $x$  value does  $V = x^3 - 6x^2 + 2x + 1$  have

- horiz tangent line
- tangent line w/ slope 1

Example #62

Find a parabola  $y = ax^2 + bx + c$  with slope 4 at 1  
slope -8 at -1 and passing through (2, 15)

Example Ball thrown upward 80 ft/s

$$h(t) = 80t - 16t^2$$

- Find max ht
- Find velocity when ball is 96 ft up on way up  
on way down

Product Rule

Let  $F(x) = f(x)g(x)$

$$\begin{aligned}
 F'(x) &= \lim_{h \rightarrow 0} \frac{f(x+h)g(x+h) - f(x)g(x)}{h} \\
 &= \lim_{h \rightarrow 0} \frac{f(x+h)g(x+h) - f(x+h)g(x) + f(x+h)g(x) - f(x)g(x)}{h} \\
 &= \lim_{h \rightarrow 0} f(x+h) \cdot \frac{g(x+h) - g(x)}{h} + \lim_{h \rightarrow 0} g(x) \cdot \frac{f(x+h) - f(x)}{h} \\
 &= f(x)g'(x) + g(x)f'(x)
 \end{aligned}$$

Product Rule Suppose  $f(x)$  and  $g(x)$  are both differentiable, so is  $f(x)g(x)$  and

$$\frac{d}{dx}(f(x)g(x)) = f(x)g'(x) + f'(x)g(x)$$

Examples

$f(x) = x \cos x$

$f(x) = (x^2 + 9x + 1)(x^9 + 18x^2 - 5)$

$f(t) = \sqrt{t}(t^2 + 6t)$

Quotient Rule

$$\left(\frac{f(x)}{g(x)}\right)' = \frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$$

"..." 
$$\frac{\text{low de hi} - \text{hi de low}}{(\text{low})^2}$$

Examples