Basic Calculus I

Class 17

Wednesday 10/14/98

The product and quotient rules.

Recall: $[f(x)+g(x)]' =$ _____;
or, more briefly;

$$[f+g]' =$$

Example: $[x^4+\sin(x)]' =$ _____.

Wouldn't it be nice if we also had the simple rule: $[f(x)\cdot g(x)]' = f'(x)\cdot g'(x)$? _____.
Unfortunately, THIS RULE IS WRONG! :-(

Product rule: $[f(x)\cdot g(x)]' = f'(x)\cdot g(x) + f(x)\cdot g'(x)$.
Or more briefly:

$$[fg]' =$$

Example: $[x^4\cdot\sin(x)]' =$ _____.

1. Now do the following exercises. (You don't need to simplify.)
(a) $[x^5\cos(x)]' =$

(b) $[x^5\cos(19)]' =$

(c) $[e^x\ln(x)]' =$

(d) $(x^3\cdot 3^x)' =$

(e) $(2^x\cdot 3^x)' =$

Quotient rule:

$$\left[\frac{f}{g}\right]' = \frac{f'g - fg'}{g^2}$$

2. Now do the following exercises. (You don't need to simplify.)

(a) $[x^5/(1+x)]' =$

(b) $[e^5/\cos(x)]' =$

(c) $[(x^2-4)/(x+2)]' =$

(d) $[\sin(x)/\cos(x)]' =$

So, $[\tan(x)]' =$

True of False? $[(x^5+8)^2]' = 2(x^5+8)$.

3. (a) Find the derivative of $f(x) = (x^5+8)^2$ by first multiplying out, and then differentiating.

(b) Find the derivative of $f(x) = (x^5+8)^2$ by rewriting it as $f(x) = (x^5+8)(x^5+8)$ and using the product rule.

4. Let $f(x) = \ln(x)/x$, and $g(x) = x/e^{-x}$.
(a) Find $f(1)$ and $g(1)$.

(b) Find $f'(1)$ and $g'(1)$.

5. Suppose $r(5) = 2$, $r'(5) = 3$, $s(5) = 7$, $s'(5) = -4$.
(a) Let $d(x) = r(x) + s(x)$. Find $d(5)$. Find $d'(5)$.

(b) Let $p(x) = r(x) \cdot s(x)$. Find $p(5)$. Find $p'(5)$.

(c) Let $q(x) = r(x)/s(x)$. Find $q(5)$. Find $q'(5)$.

ANNOUNCEMENTS

Homework, due Friday, 10/16/98: HH, section 4.3 : 2, 3, 15, 18, 27, 35.

Second exam: Thursday 10/29, in Lab.