

# Chapter 3.3: Practicing the Product Rule

## Calculus I

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1. Take the derivative of the following functions:

(a)  $f(x) = 4^x + x^2 + 4 + \ln(4)^x + \ln(4)$ .

(b)  $f(x) = x^2 4^x$

(c)  $f(x) = x^3 e^x$

(d)  $f(x) = (2x^3 - e^x)\sqrt{x}$

(e)  $f(x) = 3e^{\sqrt{x}}$

2. Calculate the derivative of  $f(x) = x^7$  two different ways:

(a) Use the power rule.

(b) Write  $f(x) = g(x)h(x)$ , with  $h(x) = x^3$  and  $g(x) = x^4$ . Use the product rule.

(c) Are your answers the same?

3. The temperature varies with height  $h$  according to  $T(h) = 40(0.92)^h$ , where  $h$  is measured in km above sea level. A bird is flying straight up at a constant speed of 12 km/hr.

(a) What is the rate of change of the temperature with respect to the altitude  $h$  when  $h = 2$ ?

(b) What is the rate of change of the temperature experienced by the bird when it is at a height of 2 km?

4. As in the previous problem, temperature varies with height  $h$  according to  $T(h) = 40(0.92)^h$ , where  $h$  is measured in km above sea level. A bird is flying straight up in such a manner that its altitude as a function of time  $t$  is given by  $h(t) = 3t^2$ , where  $t$  is measured in minutes and  $h$  in kilometers.

(a) What is the altitude of the bird after 2 minutes?

(b) At that altitude, what is the rate of change of the temperature with respect to the altitude  $h$ ?

(c) At that altitude, what is rate of change of the temperature experienced by the bird?