

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) $f(x) = e^x x^7 - 2\pi^x$

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

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

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?