The Product Rule

1. Use the product rule to show that $\frac{d}{dy}e^{3x} = 3e^{3y}$

2. Suppose a rectangular prism has edge-lengths $f(t)$, $g(t)$, and $h(t)$. What is the rate of change in the volume of the rectangular prism with respect to time? Make a geometric argument to support the rate of change you find.

3. Why does the area of a rectangle with side lengths $\sin(x)$ and x grow more slowly near $x = 0$ than near $x = 2\pi$? Why does the area continue to grow more quickly with each multiple of 2π (i.e. $x = 4\pi$, $x = 6\pi$, etc.) even though the area is always 0 at multiples of 2π?

4. Use the product rule to find the derivative of $\frac{3\cos(x) + 1}{4x^5}$