

Exercise 44

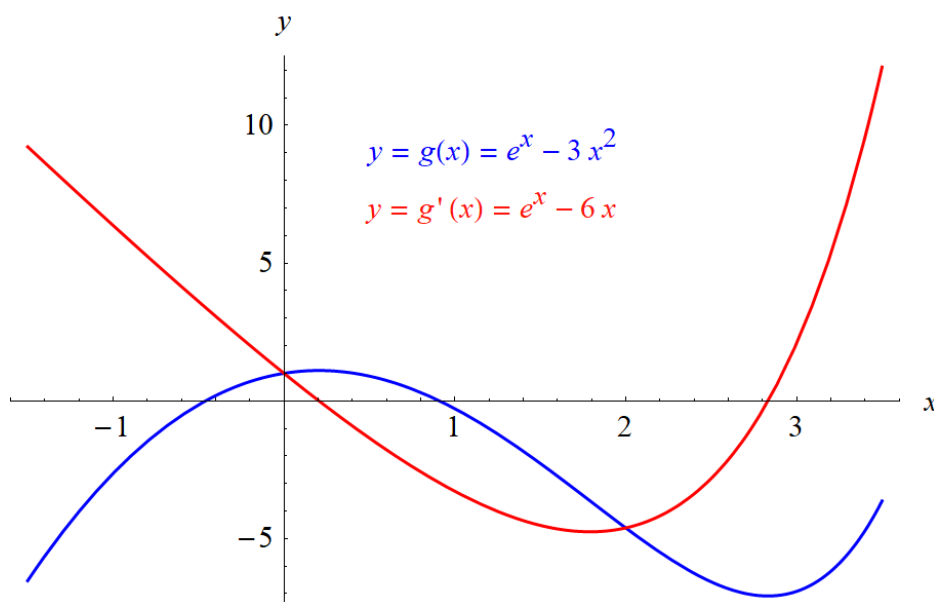
- (a) Graph the function $g(x) = e^x - 3x^2$ in the viewing rectangle $[-1, 4]$ by $[-8, 8]$.
- (b) Using the graph in part (a) to estimate slopes, make a rough sketch, by hand, of the graph of g' . (See Example 2.8.1.)
- (c) Calculate $g'(x)$ and use this expression, with a graphing device, to graph g' . Compare with your sketch in part (b).

Solution

Take the derivative of $g(x)$.

$$\begin{aligned}f'(x) &= \frac{d}{dx}(e^x - 3x^2) \\&= \frac{d}{dx}(e^x) - \frac{d}{dx}(3x^2) \\&= \frac{d}{dx}(e^x) - 3\frac{d}{dx}(x^2) \\&= (e^x) - 3(2x) \\&= e^x - 6x\end{aligned}$$

Below is a plot of $g(x)$ versus x and $g'(x)$ versus x .



Wherever $g(x)$ is increasing, $g'(x)$ is positive; wherever $g(x)$ is decreasing, $g'(x)$ is negative; and wherever the slope of $g(x)$ is zero, $g'(x) = 0$.