. 5 1. Find the derivative of $f(x) = (e^x - 3x^2)e^{-x^2}$

Solution. Using the product rule (see page 231 of the text), we have

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

. 5 2. Solve $2e^{3a+4} = 6$ for a.

Solution. First, we have

$$e^{3a+4} = \frac{6}{2} = 3$$

and next, we apply ln to both sides to get

$$\begin{aligned} \ln(e^{3a+4}) &= \ln 3 \\ 3a + 4 &= \ln 3 \\ 3a &= (\ln 3) - 4 \\ a &= \frac{(\ln 3) - 4}{3}. \end{aligned}$$

Thus, $a = ((\ln 3) - 4)/3$.