1. Compute the following antiderivatives.

   (a) $\displaystyle\int x^3 \log(x)\, dx$

   (b) $\displaystyle\int x^2 e^x\, dx$

   (c) $\displaystyle\int \big[\log(x)\big]^2\, dx$

2. Compute the following definite integrals.

   (a) $\displaystyle\int_4^7 x^5 \log(x)\, dx$

   (b) $\displaystyle\int_0^\infty \frac{1}{(1+x)^2}\, dx$

3. Let K, T, σ, and r be positive constants and let

$$g(x) = \frac{1}{\sqrt{2\pi}} \int_0^{b(x)} e^{-\frac{y^2}{2}}\, dy$$

   where $b(x) = \frac{1}{\sigma\sqrt{T}} \left[\log\left(\frac{x}{K}\right) + \left(r + \frac{\sigma^2}{2}\right) T\right]$. Compute $g'(x)$.