STA 256f19 Assignment One: Calculus Review

These homework problems are not to be handed in. They are preparation for Term Test 1 (and the rest of the course).

1. $\int_1^3 \frac{1}{t^3} dt$ [answ: 4/9]
2. $\int_0^\infty e^{-\theta x} dx$, where $\theta > 0$. [answ: $1/\theta$]
3. $\int_0^\infty x e^{-x} dx$ [answ: 1]
4. $\frac{d}{dx}(xe^x)$ [answ: $(1+x)e^x$]
5. $\frac{d}{dt} \ln(1+e^x)$ [answ: $\frac{e^x}{1+e^x}$]
6. Find the maximum or minimum of $f(x) = e^{-\frac{1}{2}(x-\mu)^2}$ [answ: max at $x = \mu$]
7. $\sum_{k=0}^{\infty} \frac{1}{2^k}$ [answ: 2]
8. For $-1 < a < 1$, find $\sum_{k=j}^{\infty} a^k$ [answ: $\frac{a^j}{1-a}$; prove it.]
9. For $\lambda > 0$, find $\sum_{k=0}^{\infty} \frac{\lambda^k e^{-\lambda}}{k!}$ [answ: 1]
10. Show $\lim_{n\to\infty} \left(1 + \frac{x}{n}\right)^n = e^x$. Hint: Use natural logs and L'Hôpital's rule.
