

## 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.  $\frac{d}{dx}(x e^x)$  [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  $\lim_{n \rightarrow \infty} \left(1 + \frac{x}{n}\right)^n = e^x$ . Hint: Use natural logs and L'Hôpital's rule.

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<http://www.utstat.toronto.edu/~brunner/oldclass/256f19>