CS7880: Rigorous Approaches to Data Privacy, Spring 2017
POTW #3

Instructor: Jonathan Ullman

Due Fri, Feb 3rd, 11:59pm
(Email to jullman+PrivacyS17@gmail.com)

- **You may work on this homework in pairs if you like. If you do, you must write your own solution and state who you worked with.**

- Solutions must be typed in LaTeX.

- Aim for clarity and brevity over low-level details.

Problem 1 (Tightness of Advanced Composition).   Recall that the advanced composition theorem says that composing k copies of an $(\varepsilon, 0)$-differentially private algorithm satisfies $(1, \delta)$-differential privacy as long as $k \leq 1/(8\varepsilon^2 \log(1/\delta))$. Show that for some choice of $k = \tilde{O}(1/\varepsilon^2)$,[1] composing k copies of an $(\varepsilon, 0)$-differentially private algorithm does not satisfy $(1, 1/10)$-differential privacy.

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[1] $f(x) = \tilde{O}(g(x))$ means that $f(x) = g(x) \cdot \text{polylog}(g(x))$. The polylog factor is not actually necessary in this problem but may come up depending on how you solve the problem.