

## Problem set 8

As this problem set is associated with the end of the course and is related to the “future hopes for ground-based GW astronomy”, rather than this set having problems with particular answers, we’ll ask you your opinions about what we might see.

1. Which current features of the black hole mass distribution from BH-BH events do you think will persist as the number of events increases? Examples might include: the apparent deficit at low enough masses or bumps at a few intermediate masses.
2. When (if ever) do you think that we will see an event with at least one black hole that is absolutely, definitely, in the pair instability mass gap?
3. When (if ever) do you think that we will see a black hole mass that is definitively *above* the pair instability mass gap (e.g.,  $200 M_{\odot}$  would do it)?
4. When (if ever) do you think that we will see a coalescence that has eccentricity  $e > 0.2$  at  $f > 50$  Hz? Note that there are tantalizing hints of nonzero eccentricity in some events, but these all rely on very low frequency where, say, it is not easy to distinguish between eccentricity, precession in the waveform, or other effects.
5. What do you think will be the first clear non-binary signal seen with ground-based GW detectors?
6. When do you think we will reach 10 NS-NS or NS-BH events strong enough to see clear electromagnetic counterparts?
7. When do you think the current Hubble parameter,  $H_0$ , will be measured to 1% precision using just gravitational wave events plus their electromagnetic follow-up?
8. What is your favorite question about future ground-based GW detections?