Order-of-magnitude problem homework

(based on a problem from David Weinberg's page)

Astrophysics of GW sources

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You are a science officer on board Federation starship USS Schwarzschild. While patrolling borders with the Romulan Empire, your ship gets sucked in a giant vortex and transported to an unknown distant location. Just before exiting the vortex, you see that you are entering a globular cluster and that Milky Way is still in sight. However, the ship's sensors, including the viewscreen, are now down. Propulsion is badly damaged and the ship is coasting. Your captain (*) demands a report. In a stressful moment, you realize that transporters still work. You take a piece of coal from your personal rock collection, attach a thermometer to it and beam it to space next to the ship. After an initial transient, the thermometer levels off at 25 K. Your caption wants to know:

- What is the probability that your free-floating ship will collide with a star?
- Tachyon readings from the vortex were inconclusive. Discuss the probability that the vortex displaced you not only in space but also in time.
- To establish a wormhole, you need to locate a dormant black hole. Where is the highest probability of finding one?

(*) Aww, those rookie captains… Somebody should teach them that life is not as simple as holodecks at Starfleet Academy.