

OpenStax Astronomy, Ch.24: WS Problems (Apr-2021)

Review Questions

1. How does the equivalence principle lead us to suspect that spacetime might be curved?
2. If general relativity offers the best description of what happens in the presence of gravity, why do physicists still make use of Newton's equations in describing gravitational forces on Earth (when building a bridge, for example)?
3. Einstein's general theory of relativity made or allowed us to make predictions about the outcome of several experiments that had not yet been carried out at the time the theory was first published. Describe three experiments that verified the predictions of the theory after Einstein proposed it.
4. If a black hole itself emits no radiation, what evidence do astronomers and physicists today have that the theory of black holes is correct?
5. What is an event horizon? Does our Sun have an event horizon around it?
6. What is a gravitational wave and why was it so hard to detect?
7. What are some strong sources of gravitational waves that astronomers hope to detect in the future?
8. Suppose the amount of mass in a black hole doubles. Does the event horizon change? If so, how does it change?
9. Which is likely to be more common in our Galaxy: white dwarfs or black holes? Why?
10. If the Sun could suddenly collapse to a black hole, how would the period of Earth's revolution about it differ from what it is now?
11. Look up G , c , and the mass of the Sun in Appendix E and calculate the radius of a black hole that has the same mass as the Sun. (Note that this is only a theoretical calculation. The Sun does not have enough mass to become a black hole.)