Astrophysical Objects

Planet Formation

Based on: https://chongchonghe.github.io/teaching/2021-astr101/#Teaching

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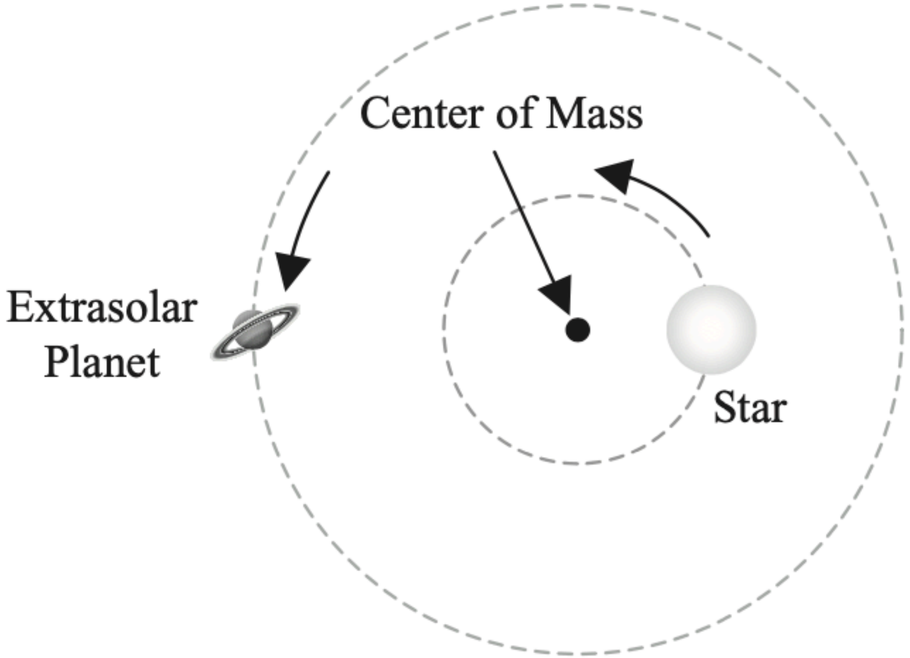


Figure 1. Extrasolar planet and star as seen from above. (not to scale)

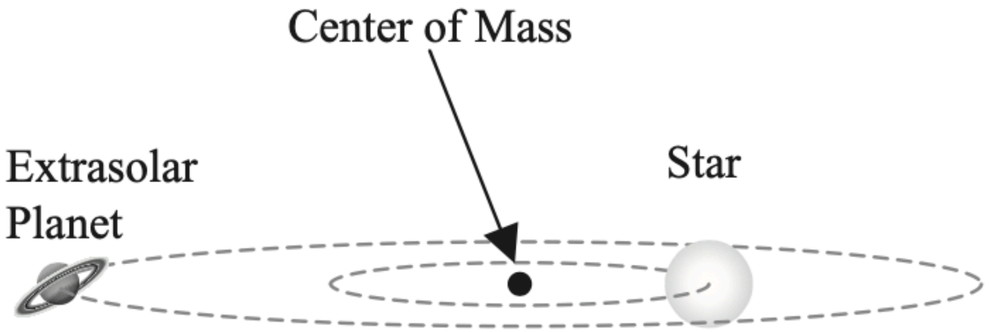


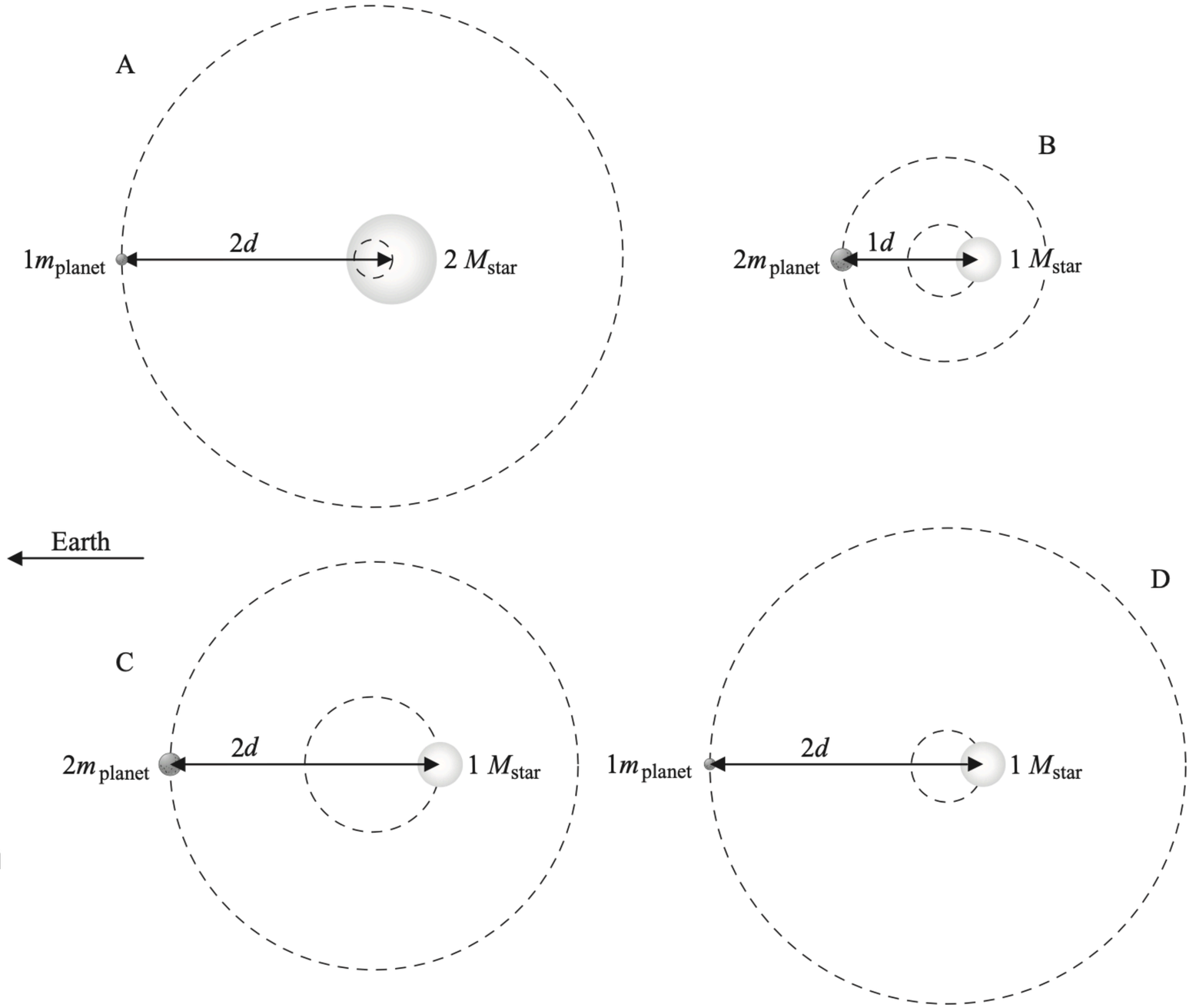
Figure 2. Extrasolar planet and star as seen edge-on or from the side. Note that the extrasolar planet is moving toward you. (not to scale)

Planetary motion

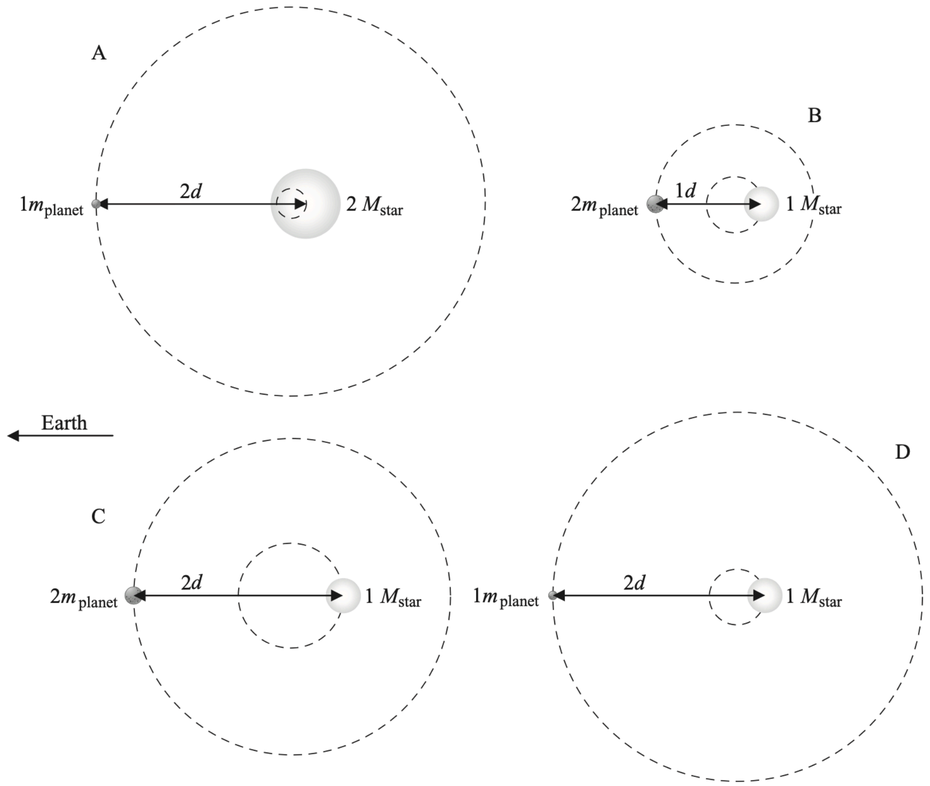
The amount that the light from a star in an extrasolar planet system will be Doppler shifted depends on the mass of the star M_{star}, the mass of the planet m_{planet}, and the distance d between the star and the planet. This relationship can be written as:

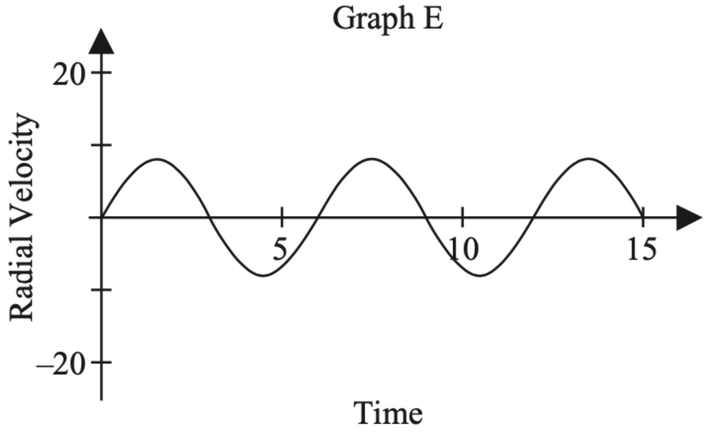
$$\textit{Amount of Doppler shift in stars's light} \propto \frac{m_{planet}}{\sqrt{M_{star}\, d}}$$

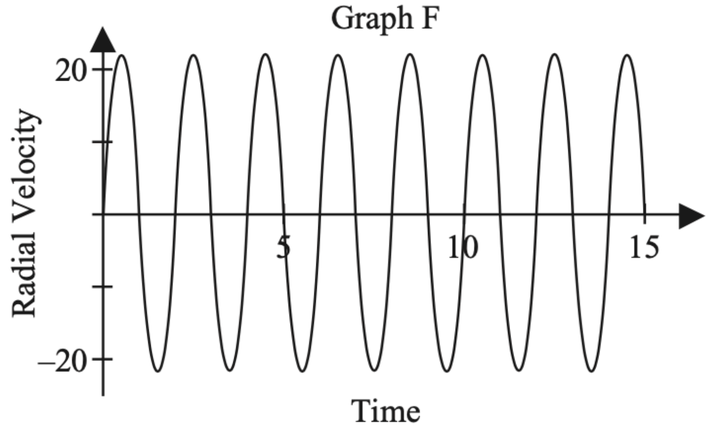
- Which extrasolar planet system(s) has the lowest mass star?
- Which extrasolar planet system(s) has the highest mass planet?
- In which extrasolar planet system(s) is the planet closest to the star?
- In which extrasolar planet system(s) would we receive light from the star with the largest Doppler shift?
- Which system has the extrasolar planet that is easiest to detect from Earth?

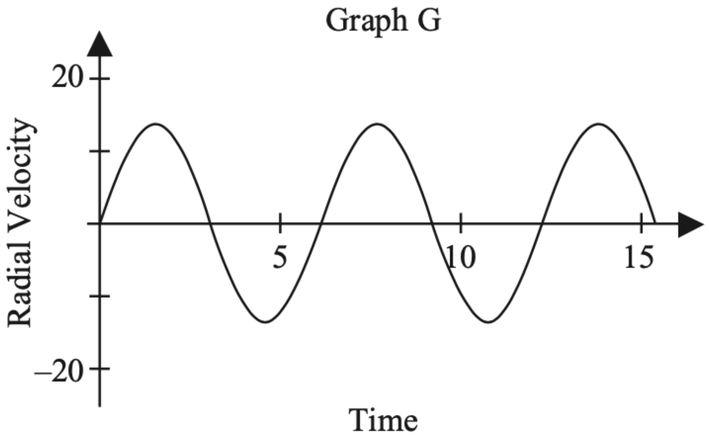


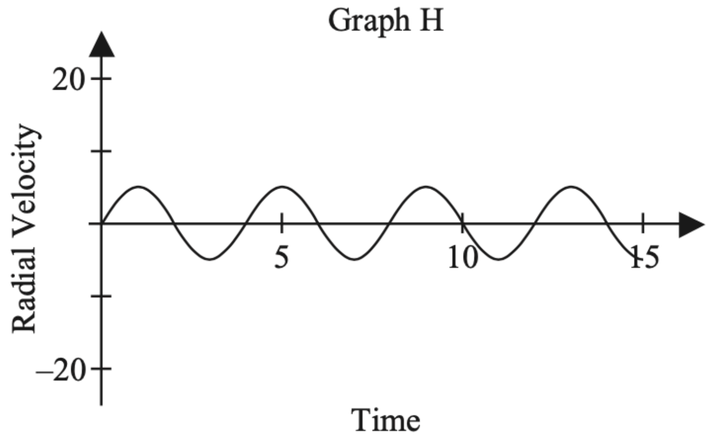
Match each graph (E–H) with the extrasolar planet systems (A–D). Explain your reasoning.







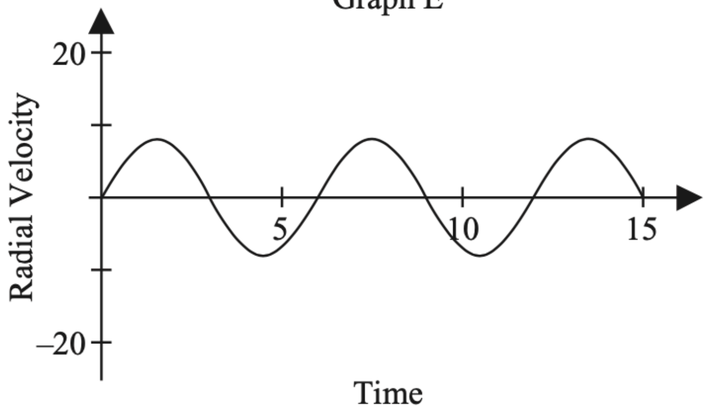




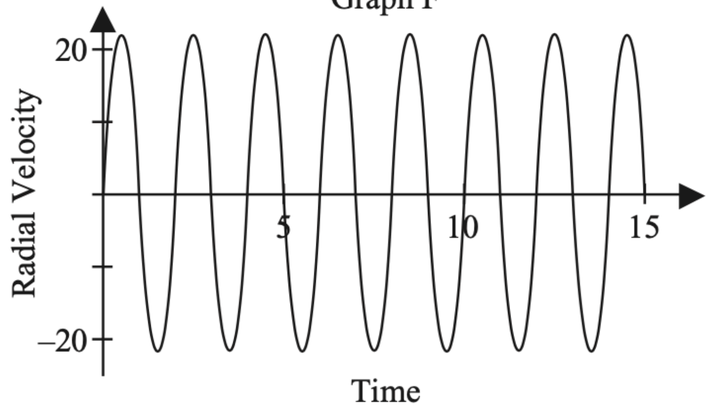
Which point corresponds with the ***star*** moving with its fastest speed toward Earth ?

Which point corresponds with the ***extrasolar planet*** moving with its fastest speed toward Earth. Explain your reasoning.

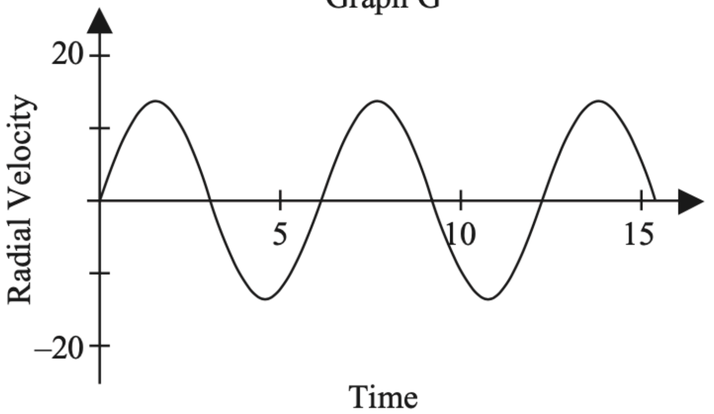
Graph E



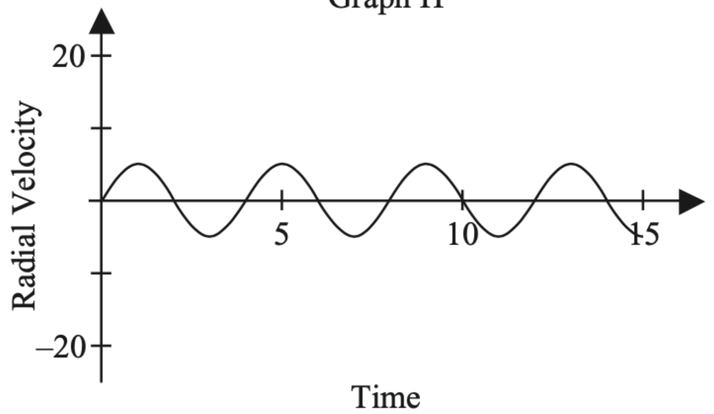
Graph F



Graph G



Graph H



Which point corresponds with the ***star*** moving with its fastest speed toward Earth ?

Which point corresponds with the ***extrasolar planet*** moving with its fastest speed toward Earth. Explain your reasoning.