Read each problem **very carefully** before starting to solve it. Each problem is worth 5 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. The life expectancy E of a star depends on its mass M. The relation is given by $E = M^{-2.5}$, where M is solar masses and E solar lifetimes. $E = 1$ actually corresponds to a life expectancy of 10 billion years.

   (a) Does a more massive star have a longer or a shorter life expectancy than a less massive star? Explain your reasoning.

   (b) Spica is a star that is about 7.3 solar masses. What is its life expectancy?

   (c) Vega is a star that is expected to live about 6.36 billion years. What is the mass of Vega?

   (d) If one star is three times as massive as another star, how do their life expectancies compare?