QUIZ 8 - MATH 111 Your Name:

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 in solar lifetimes of a star depends on its mass M in solar masses according to the relation $E = M^{-2.5}$. The sun is thought to be at the middle of its life with a total life expectancy of about 10 billion years. Thus, value E = 1 corresponds to a life expectancy of 10 billion years.
 - (a) Spica is a star that is about 7.3 solar masses. What is its life expectancy?

(b) Use functional notation to express the life expectancy of a star with mass equal to 0.5 solar mass and then calculate its value.

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

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

2. For objects that are similarly shaped, the terminal velocity T in a free fall (assuming that air resistance is proportional to the square of the velocity) varies in proportion to the square root of their length L, with constant of proportionality k. This relation is given by

$$T = kL^{0.5}$$

(a) A 6-foot man is 36 times as long as a 2-inch mouse. How does the terminal velocity of a man compare with that of a mouse? Show full work.

(b) If the 6-foot man has a terminal velocity of 120 miles per hour, what is the terminal velocity of the 2-inch mouse?

(c) A squirrel is about 7 inches long. Assuming that a 6-foot man has terminal velocity of 120 miles per hour, what is the terminal velocity of the squirrel?