8 (a) A spacecraft is moving at a constant velocity v relative to an observer on Earth. The spacecraft is traveling in a straight line from point A to point B, which are 10 light-years apart as measured in Earth's frame.

Calculate the time it takes for the spacecraft to travel from point A to point B as measured by the observer on Earth if the velocity of the spacecraft is $0.8c$, where c is the speed of light. [2 marks]

(b) Determine the time experienced by a clock on the spacecraft for the journey from A to B. [3 marks]

(c) Suppose a light signal is sent from point A to point B just as the spacecraft passes point A. How much time does it take for the signal to reach point B as measured by:

i. The observer on Earth.

ii. The astronaut on the spacecraft.

[3 marks]

(d) Assume that when the spacecraft reaches point B, a signal is sent back to point A. According to the observer on Earth, do the events "spacecraft reaches point B" and "signal reaches point A" occur simultaneously? Explain your reasoning. [2 marks]