Question 16 **(12 marks)**

In the future it is possible that humans may travel to distant places like Alpha Centauri that is 4.13×10^{13} km from Earth. Imagine you are on a spacecraft travelling past Earth towards Alpha Centauri at $0.720c$ relative to Earth. On your journey you pass another spacecraft travelling parallel and in the opposite direction to you. You measure the relative velocity of the other spacecraft as $0.695c$.

(a) Calculate the velocity of the other spacecraft relative to Earth. (3 marks)

Answer _____ c

(b) Calculate the number of years for your spacecraft to journey from Earth to Alpha Centauri as measured by an observer on Earth. (3 marks)

Answer _____ years

(c) Calculate the number of years the journey will take as measured by those on the spacecraft travelling at $0.720c$ relative to Earth. (3 marks)

(d) For those on the spacecraft travelling to Alpha Centauri at $0.720c$ relative to Earth, calculate the time they would have observed to have elapsed on Earth during the journey from Earth to Alpha Centauri. (3 marks)

Answer _____ years