

Stars Homework #5 Answers

Since the values you get for these things are based upon how you click the graph, your values may or may not match mine exactly....

Object	Period (days)	Average Vel. (km/s)	$a_x \sin(i)$ (lt-sec)	$f(M)$ M_{\odot}
X-ray binary 0	17.59	120	96.67	3.21
X-ray binary 1	15.28	89.5	62.63	1.16
X-ray binary 2	14.63	56.5	37.86	0.279
X-ray binary 3	21.11	120.5	116.5	3.90

The next table has the following values.

Object	$f(M)$ M_{\odot}	M_c M_{\odot}	i (degrees)	M_x M_{\odot}
X-ray binary 0	3.21	5.2	85	1.38
X-ray binary 1	1.16	2.23	77	0.74
X-ray binary 2	0.279	4.4	83	12.9
X-ray binary 3	3.90	7.1	81	2.3

To solve the formula for the x-ray mass, use the following -

$$f(M) = \frac{(M_c \sin(i))^3}{(M_c + M_x)^2}$$

$$(M_c + M_x)^2 = \frac{(M_c \sin(i))^3}{f(M)}$$

$$M_x = \sqrt{\frac{(M_c \sin(i))^3}{f(M)}} - M_c$$

And then you can get the values for the x-ray mass fairly easily...

And this also shows that x-ray binary 2 has way too much mass to be a neutron star, so it is our likely black hole.