(b) Use the graph above to calculate an estimate of the average rate of disappearance of A over the first 20 seconds of the reaction.

$$Rate = -\frac{\Delta[A]}{\Delta t} = -\frac{0.014\ M - 0.10\ M}{20\ s - 0\ s} = -\frac{-0.086\ M}{20\ s} = 0.0043\ M/s$$

So A is disappearing at an average rate of about 0.004 M/s over the first 20 seconds of the reaction.

(c) Use the graph above to calculate an estimate of the initial rate of the reaction.

$$Rate = -\frac{\Delta[A]}{\Delta t} = -\frac{0.08\ M - 0.10\ M}{2\ s - 0\ s} = -\frac{-0.02\ M}{2\ s} = 0.01\ M/s$$

One can estimate the initial rate of reaction from graphical data by calculating the slope using the first few data points. As long as the slope is close to linear, the difference between this estimate of the initial rate and the true instantaneous initial rate will be negligible. In this case, the plot retains approximate linearity through the first three or four points, allowing the calculation above to yield a decent estimate: 0.01 M/s.