5. [13 points] Two particles move in the xy-plane. At time $t > 0$, the position of particle A is given by

$$\begin{cases} x(t) = -6 - 3t \\ y(t) = 2t - k \end{cases}$$

and the position of particle B is

$$\begin{cases} x(t) = -4t \\ y(t) = t^2 - t - 8 \end{cases}$$

For the following questions, <u>justify your answers algebraically.</u>

a. [4 points] Find k so that the two particles must collide.

Answer: $k =$ _____

b. [3 points] At the time the particles collide, which is moving faster?

Answer: PARTICLE A PARTICLE B

c. [3 points] Use MID(2) to approximate the length of the path traveled by particle B between $t = 0$ and $t = 4$. Write out all the terms in your sum.

Answer: _____

d. [3 points] For what positive values of t is the slope of the tangent line to the path of particle B positive?

Answer: _____