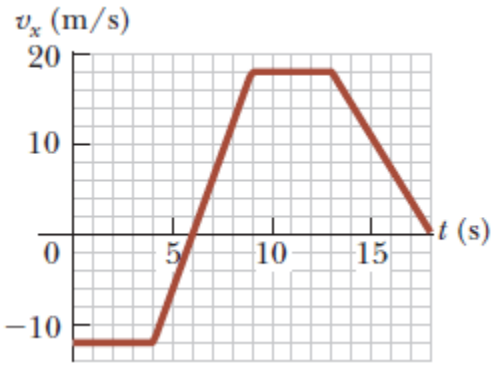
AP Physics C: Mechanics Name: _____

Unit 1 Quiz Class Period: _____

Show all steps required to arrive at your answer and give answers with the correct units if applicable. Most of your grade on the following questions will be based on correct justification and not the final answer. **A correct answer with no justification will receive no credit.** Ensure to include correct units with your answer. Please circle your final answers.

1. Ponder the given velocity vs. time graph for an object in motion:



a) What is the object's average acceleration?

b) What is the object's acceleration at t = 15 s.

c) At what time(s) is the object speeding up?

d) At what time(s) is the object at rest?

e) Given that x(0) = 20 m, find the position of the object at t = 18 s.

2. A Shinkansen train is at rest in Shin-Osaka Station. It starts to accelerate and travels 1500 m in 5 s. After 5 s, the train slams on the brakes and decelerates at a rate of 15 m/s^2.

a) Calculate the maximum velocity of the train.

b) Calculate the average velocity of the train during its entire motion.

3. Tony Li flees a tiny bee with an acceleration given by: $a(t) = 6 - 6t$. At time t = 0 s, he is at the origin with an initial velocity of 6 m/s.

a) Write an expression for Tony's velocity over time, v(t).

b) Calculate Tony's displacement at t = 6.0 s.

c) Calculate Tony's maximum positive displacement from the origin.

4. A penguin is thrown vertically upward with an initial speed of 30 m/s from ground level. One second later, another penguin is thrown vertically downward with a speed of 10 m/s from the top of 100 m tall building. At what height above the ground will the two penguins hit each other?