Name: _____

PHYS 1210 Quiz 1

Constant acceleration in one dimension, Standards 1–3

Some useful equalities

1 hour = 60 minutes = 3600 seconds

1 mile = 5280 feet

1 meter = 3.28 feet

Metric prefixes

k	10^3	m	10^{-3}
M	10^6	μ	10^{-6}
G	10^9	n	10^{-9}
T	10^{12}	p	10^{-12}

1. Here's a scenario:

   A prankster throws a rock straight downward with an initial speed of 10 m/s from the top of a 100-m high building. How much time does the rock take to reach the ground?

   I'm not asking you to solve the problem. Instead, select the one constant-acceleration kinematic equation below that could most directly be applied to this problem.

   a. $v = v_0 + at$ b. $\Delta y = v_0 t + 1/2\ at^2$ c. $v^2 - v_0^2 = 2a\Delta y$ d. $y - y_0 = ½\ (v_0 + v)\ t$

2. Here's a scenario:

   Raindrops fall 1700 m from a cloud to the ground. If they fall with constant acceleration, how fast would the drops be moving as they hit the ground?

   It turns out that the easiest equation to use for this problem is $v^2 - v_0^2 = 2a\Delta y$. For each quantity in the equation, either tell me its value (signed number and units), or identify it as the desired unknown in the problem.

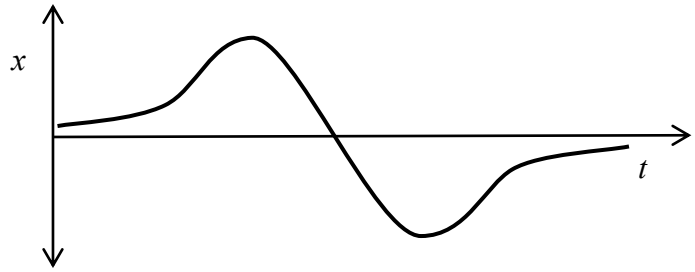
   v a

   v_0 Δy

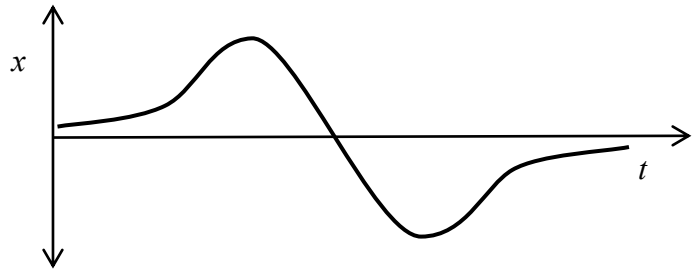
3. Rival gang members Tybalt and Mercutio notice each other when they are at opposite ends of the Verona town square. 74.0 meters apart. They run toward each other, eager to insult each other and display their bravery. Tybalt runs toward Mercutio at a speed of 3.3 m/s, while Mercutio runs toward Tybalt at 3.1 m/s. How much time will it take for the distance between them to be a convenient taunting distance of 4.0 meters?

4. Each of the questions below contains the same graph of position x as a function of time t and a verbal description of some particular conditions of motion. On the graphs, positive x is in the upward (↑) direction. Mark on each graph the specific moment, moments, or time intervals that the conditions on the graph match the description. If the conditions described are not met at any time on the graph, indicate that.

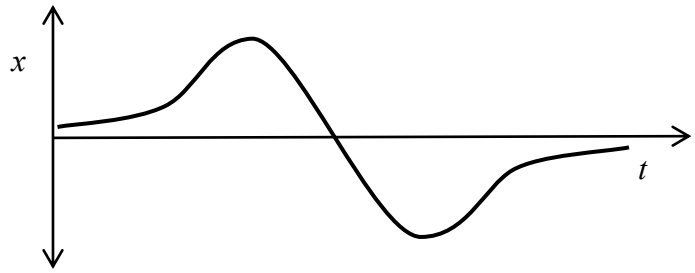
a. speeding up



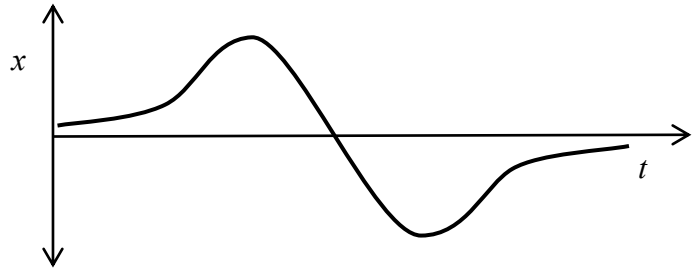
b. slowing down



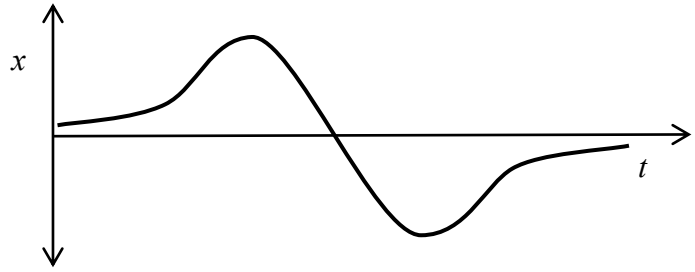
c. $a < 0$



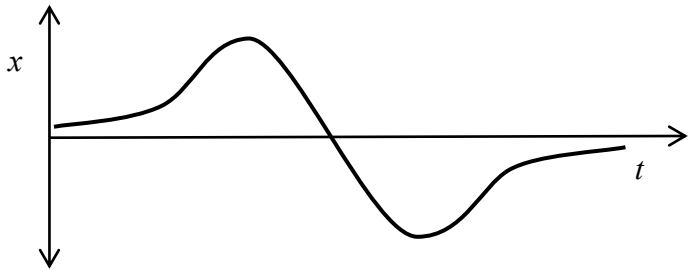
d. $a = 0$



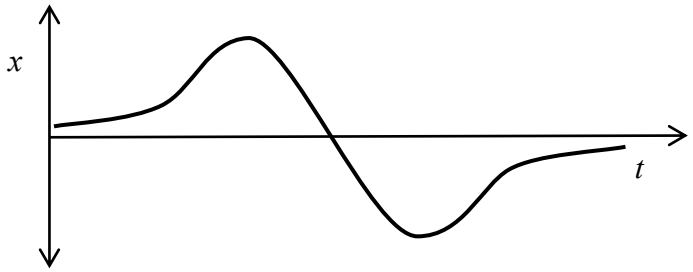
e. $a > 0$



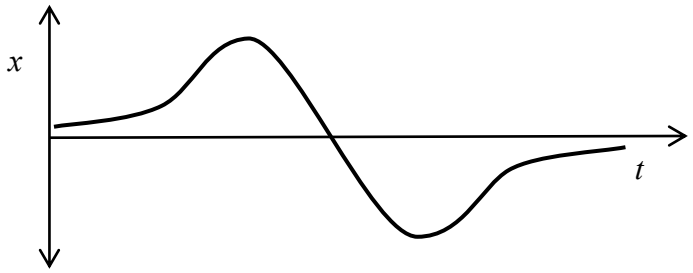
f. $v = 0$



g. $v < 0$



h. $v > 0$



5. A world's land speed record was set by Colonel John P. Stapp in March 1954, when he rode a rocket sled that moved along a track at 1020 km/h. He and the sled were brought to a stop from this speed in 1.4 s.

   a. What was his initial speed in meters per second?

   b. What was his initial speed in miles per hour?

   c. What acceleration *a* did Col. Stapp experience when stopping?

d. How far, in meters, did the sled travel while it was braking to a stop?