

Physics 200 Mid-Term Review: 2-D Kinematics

Problems with 1-D Kinematics

1. With full afterburners, the F-16 fighter jet has an acceleration of 12.7 m/s^2 . It requires a velocity of 170 miles/hour to take off.
 - a. How long does it take the F-16 to reach take off speed if it starts from rest?
 - b. How long (answer in feet) does its runway need to be?

2. A pebble is dropped into a well. The splash is heard 1.5 seconds after it was released. Neglecting the speed of sound, how far down is it to water level?

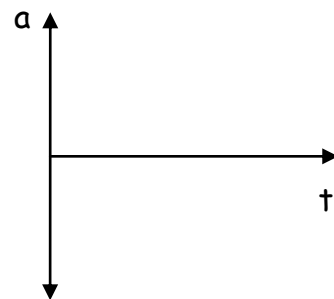
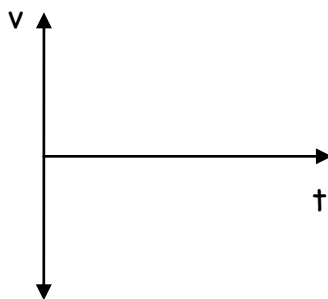
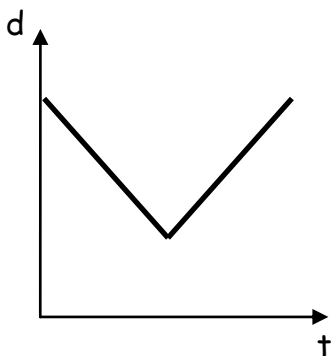
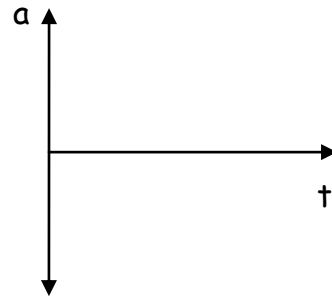
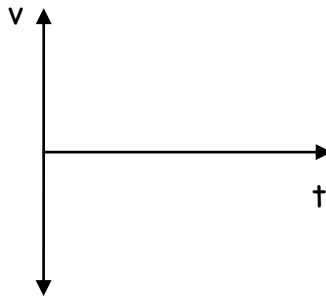
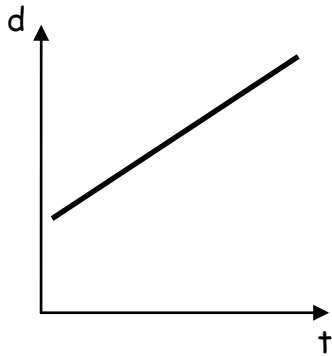
3. A soccer ball is kicked straight up in the air and takes 6.0 seconds to come back to Earth. Find out how high it went.

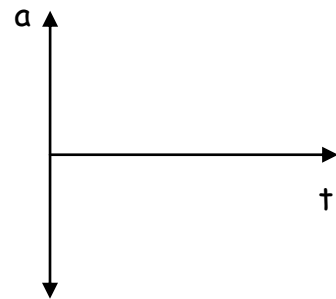
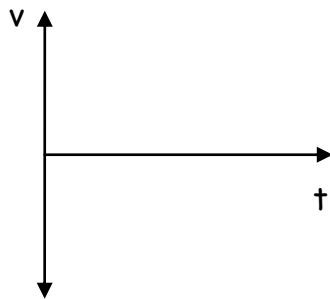
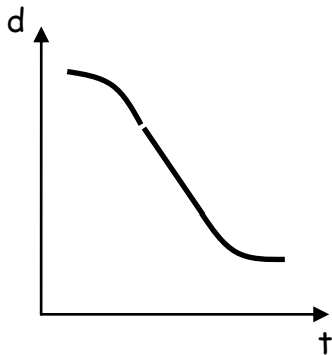
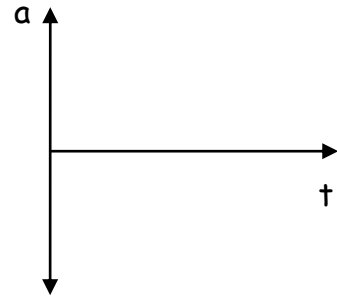
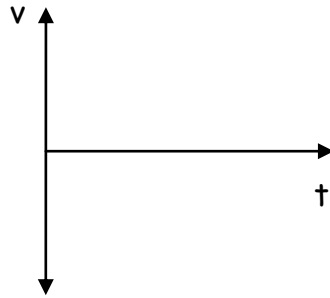
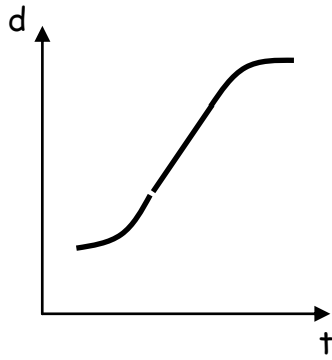
4. A stone is thrown vertically upward with a speed of $+12.0 \text{ m/s}$ from the edge of a cliff 75.0 m high. How much later does it reach the bottom of the cliff?

5. A speeding motorist traveling 35 m/s passes a stationary police officer. The officer immediately begins pursuit at a constant acceleration of 1.5 m/s^2 . How much time will it take the police officer to reach the speeder?

Graph Analysis

Using the information provided in one graph, complete the other 2.





6. A rocket rises vertically, from rest, with an acceleration of 3.2 m/s^2 until it runs out of fuel at an altitude of 1200 m. After this point, its acceleration is that of gravity, 9.8 m/s^2 downward.

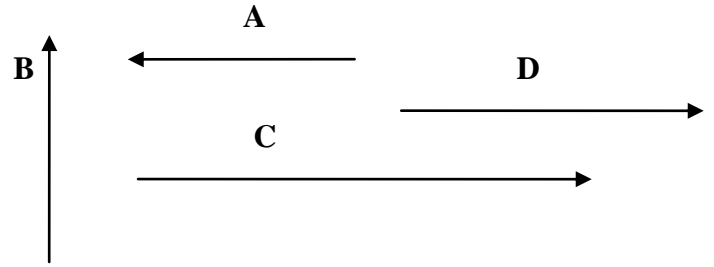
- What is the velocity of the rocket when it runs out of fuel?
- How long does it take to reach this point?
- What maximum altitude does the rocket reach?
- How much time (total) does it take to reach maximum altitude?
- With what velocity does the rocket strike the Earth?
- How long (total) is it in the air?

7. A horizontal projectile is shot from desk height (1.0 meters). Is the time it takes to hit the ground dependent on the horizontal velocity? Why or why not?

8. An arrow is shot from ground level with speed of 35 m/s at an angle 50° above the horizontal. What is the vertical component of its velocity at its highest point? How far does it go? How long is it in the air?

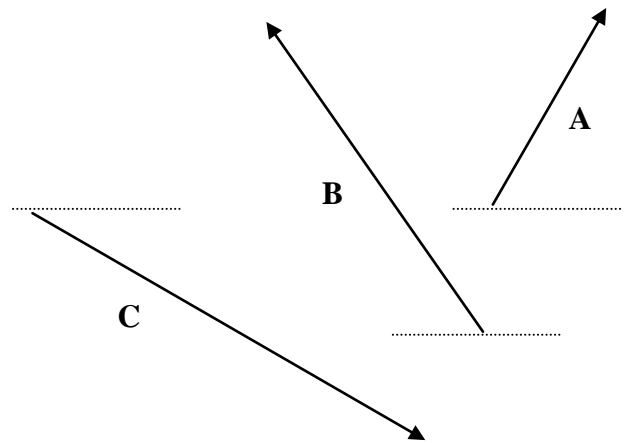
Vectors

1. Find the vector sum of $\mathbf{A} + \mathbf{B} + \mathbf{C} + \mathbf{D}$. (6 pts) $\mathbf{A} = 3.0\text{cm}$, $\mathbf{B} = 3.0\text{ cm}$, $\mathbf{C} = 6.0\text{cm}$, and $\mathbf{D} = 4.0\text{cm}$



2. Find the vector sum of $\mathbf{A} + \mathbf{B} + \mathbf{C}$. (6 pts)

$\mathbf{A} = 3.0\text{cm @ } 45^\circ$
 $\mathbf{B} = 3.0\text{ cm @ } 60^\circ$
 $\mathbf{C} = 6.0\text{cm @ } 30^\circ$



3. A boat, whose speed in still water is 1.70 m/s , must cross a 260-m -wide river and arrive at a point 0 m upstream from where it starts. To do so, the pilot must head the boat at a 45° upstream angle. What is the speed of the river's current? (6 pts)

4. What minimum speed will car #23 need to make this jump successful? (6 pts)

