Prof. Anchordoqui

Problems set # 1 **Physics 168**

1. Noah's ark was ordered to be 300 cubits long, 50 cubits wide, and 30 cubits high. The cubit was a unit of measure equal to the length of a human forearm, elbow to the tip of the longest finger. Express the dimensions of Noah's ark in meters, and estimate its volume in m^3.

2. Global positioning satellites (GPS) can be used to determine positions with great accuracy. The system works by determining the distance between the observer and each of several satellites orbiting the Earth. If one of the satellites is at a distance of 20,000 km from you, what percent accuracy in the distance is required if we desired a 2 m uncertainty? How many significant figures do we need to have in that distance?

3. A friend asks to borrow your precious diamond for a day to show her family. You are a bit worried, so you carefully have your diamond weighed on a scale which reads 8.17 g. The scale accuracy is claim to be ± 0.05 g. The next day you weigh the returned diamond again, getting 8.09 g. Is this your diamond?

4. The position of a stone dropped from a cliff is described approximately by $x = 5\ t^2$. The x-direction is downwards and the origin is at the top of the cliff. Find the velocity of the stone as a function of time.

5. Estimate (a) how long it took King Kong to fall straight down from the top of the Empire State Building (380 m high), and (b) his velocity just before "landing."

6. Upon graduation, a joyful physics student throws her cap straight upward with an intial speed of 14 m/s. (a) How long does it take for the cap to reach it highest point? (b) What is the distance to the highest point? (c) Assuming the cap is caught at the same height from which it was released, what is the total time the cap is in flight?

7. The acceleration due to gravity on the Moon is about one sixth what it is on the Earth. If an object is thrown vertically upward on the Moon, how many times higher will it go than it would on Earth, assuming the same initial velocity.

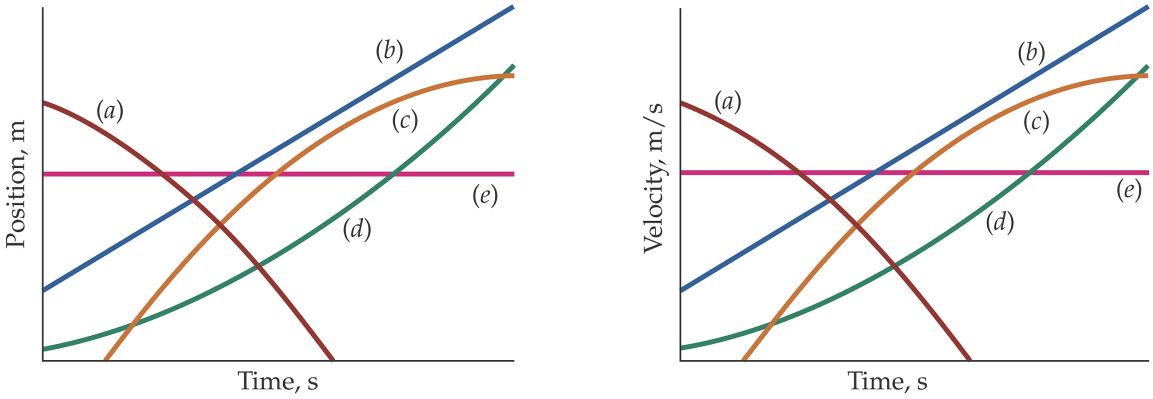
8. A car is speeding at constant 56 mi/h in a school zone. A police car starts from rest just as the speeder passes by it and accelerates at constant rate of 5 m/s^2. (a) When does the police car catch the speeding car? (b) How fast is the police car traveling when it catches up with the speeder? (c) How fast is the police traveling when it is 25 m behind the speeding car

9. A falling stone takes 0.28 s to travel past a window 2.2 m tall. From what height above the top of the window did the stone fall?

10. A rock is dropped from a sea cliff, and the sound of it striking the ocean is heard 3.2 s later. If the speed of sound is 340 m/s, how high is the cliff?

11. A person jumps (with no initial velocity) from a fourth-story window 15.0 m above a firefighter's safety net. The survivor stretches the net 1.0 m down before coming to rest. (a) What was the average deceleration experienced by the survivor when she was slowed to rest by the net?

12. Agent Bond is standing on a bridge, 12 m above the road below, and his pursuers are getting too close for comfort. He spots a flatbed truck approaching at 25 m/s, which he measures by knowing that the telephone poles the truck is passing are 25 m apart in this country. The bed of the truck is 1.5 m above the road, and Bond quickly calculates how many poles away the truck



should be when he jumps down (with no initial velocity) from the bridge onto the truck to make his getaway. How many poles is it?

13. Pelicans tuck their wings and free fall straight down when diving for fish. Suppose a pelican starts its dive from a height of 16.0 m and cannot change its path once committed. If it takes a fish 0.2 s to perform evasive action, at what minimum height must it spot the pelican to escape? Assume the fish is at the surface of the water.

14. Which of the position-versus-time curves in the figure best shows the motion of an object: (a) with positive acceleration; (b) with constant positive velocity; (c) that is always at rest; and (d) with negative acceleration and positive velocity.

15. Which of the velocity-versus-time curves in the figure best describes the motion of an object: (a) with constant positive acceleration; (b) with positive acceleration that is decreasing with time; (c) with positive acceleration that is increasing with time; and (d) with no acceleration.