Physics 31A First Test (100 pts Max.)
Fall 2003

1. (14) Two knights with lances are about to joust. Sir John the Slow gallops south at 5.0 km/h, while Sir Peter the Fast races north at 25 km/h. What is the velocity of Jon with respect to (i.e., as seen by) Peter? At what speed do they close the gap between one another?

2. (14) A skier is moving at 85 km/h straight down a tall mountain having a 60.0^{o} slope. At what rate is his altitude decreasing? Draw a diagram.

3. (14) Refer to Fig. 1 and assume the gerbil starts out heading north. (a) What is his velocity at t = 12s; at t = 38 s? (b) What is his velocity at 42.5 s?

4. (14) The person in the gondola shown in Fig 2 throws a ball at 40.0^{o} to the horizon at 10.0 m/s. If the ball is launched at a height of 100 m, where will it land? Ignore air friction.

5. (14) Someone at a third-floor window (12.0 m above the ground) hurls a ball download at 45.0^{o} at a speed of 25.0 m/s. How fast will it be traveling when it strikes the sidewalk?

6. (16) A burning firecracker is tossed into the air at an angle of 60^{o} up from the horizon. If it leaves the hand of the hurler at a speed of 30 m/s, how long should the fuse be set to burn if the explosion is to occur 20 m away?

7. (14) Given the equation describing the motion of a falling object $l = Ct^2$ (where C is a constant), show that its average speed during the interval from t to $(t + \Delta t)$ is: $V\text{av} = 2Ct + C\Delta t$