Math 130 Day 41

Office Hours (LN 301/301.5): M 3:30-4:30, Tu 11:00-1:00, W 12:15-1:15, F 1:30-2:30. Other times by appointment. **Math Intern:** Sun through Thurs: 3:00–6:00, 7:00–10:00pm. **Website:** Use the links at the course homepage on **Canvas** or go to my course Webpage: `http://math.hws.edu/~mitchell/Math130F16/index.html`.

Practice and Reading

Review Section 4.9. Practice antidifferentiation. Page 328–329 #59, 61, 65, 67–71 odd, 77, 85, 97, 107, 109, and 113. Read Chapter 5.1 to find out what lies ahead if you are taking Calculus II!

Applications of Antidifferentiation

1. A traffic engineer monitors the **rate** at which cars enter the NY Thruway outside Albany. From his data he estimates that between 4 and 6 pm, the **rate** $r(t)$ at which the cars enter the thruway is $r(t) = 100 + 1.2t - .03t^2$ cars per minute, where $t = 0$ is 4:00.

a) Find $R(t)$, the function which describes the number of cars that have entered the thruway since 4:00 pm. [Note: $R(0) = 0$.]

b) Find the number of cars that enter the thruway between 4:00 and 5:00. (Remember t is in minutes.)

c) Find the number of cars that enter the thruway between 4:30 and 5:30.

2. A ball thrown down from a roof 49 meters high reaches the ground in 3 seconds. What was its initial velocity? (Recall: that the acceleration is constant and equal to -9.8 m/sec^2.)

3. My Honda Accord accelerates from 0 to 88 ft/sec (60 mph) in 13 seconds.

a) Assume that the acceleration is constant, a. Find the particular velocity function of the car.

b) Find the position function of the car.

c) How far does it travel in this 13 second period?

4. A car is traveling at 90 km/h when the driver sees a deer 75 m ahead and slams on the brakes. What constant deceleration is required to avoid hitting Bambi? [Note: First convert 90 km/h to m/s.]

5. A BMW M3 brakes from 88 ft/s (which is 60 mph) to 0 at a constant rate of $a(t) = -33$ ft/s^2.

a) Find the corresponding velocity and distance functions.

b) How much time does it take to stop? (This is saying something about velocity.)

c) How far does it travel during this time? (This is about distance.)

6. a) An oil supertanker is traveling at 16 knots (a knot is 1 nautical mile per hour and a nautical mile is 6080 feet) requires 3 nautical miles to stop with the engines in full-reverse. Find the deceleration for the tanker, assuming this rate is constant.

b) How much time passes during this process?

7. In the final sprint of a crew race, the challenger is rowing at a constant velocity of 12m/s. At the point where the leader is 100m from the finish and the challenger is 15m behind, the leader is rowing at 8m/s but is accelerating at 0.5m/s/s. Who wins?

8. Extra Credit. Bring to Lab: A sprinter in a 100m race explodes of the starting block with an acceleration of 5 m/s^2 which she sustains for the first 2 seconds. Her acceleration then drops to 0 for the remainder of the race. You will have to divide the race into two segments.

a) Find the velocity and position function for the first 2 seconds.

b) Find the velocity and position function for the rest of the race.

c) What is her time for the race?

Math 130, Day 41. Hand In at Lab. Name: ________________________

1. (WeBWorK #3) A stone was dropped off a cliff and hit the ground with speed 120 ft/s. What was the height of the cliff?

2. (WeBWorK #2) Acceleration due to gravity is approximately -1.6 m/sec^2 on the moon (roughly) one-sixth of what it is on earth. Assume Neil Armstrong (do you know who he was?) threw a ball upward from the moon's surface at a velocity of 24 m/sec.

a) Find the position as a function of time.

b) When did the ball hit the ground?

c) What was the maximum height of the ball? First find the time of the maximum, then the height.