Homework #6

Goal: More Antiderivatives, Related Rates and Physics Motion Problems

For 1-2 find the function f which satisfies each of the following:

1. $f'(x) = \sec^2 x + \sin x - 2 \cos x$ and $f\left(\dfrac{\pi}{3}\right) = -4$

2. $f'(x) = \left(x^2 + \dfrac{1}{x^2}\right)\left(x^2 + \dfrac{1}{x^2}\right)$ and $f(1) = \dfrac{19}{15}$.

3. A child riding in a car driving along a straight road towards a traffic intersection. She is looking through binoculars when she sees a water tower off to the side. The tower is located 400 ft from the nearest point on the straight road, at the intersection. At a particular moment, the car is moving at 50 feet per second, and the car is 500 feet from the tower. How fast must the child be rotating the angle so that the binoculars are pointing to keep the tower in view?

- Diagram
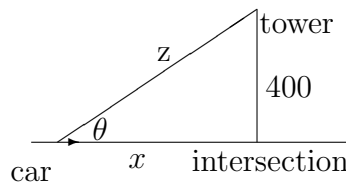
4. Suppose that Dan throws a ball, from the ground, straight upward in the air with an initial velocity of 128 meters per second. The ball has acceleration $a(t) = -32$ feet per second. Suppose Sam is lying on the ground under the ball. Answer the following questions:

(a) What is the maximum height the ball reaches?

(b) What is the balls velocity at time t $= 5$?

(c) At what time will the ball hit Sam on the ground?

(d) What is the balls velocity when it hits Sam?

5. RETALIATION! When Dan saw that the ball actually hit Sam, he ran away, up a tree. Dan climbed up the tree exactly 155 feet (above the ground). Revenge was necessary! Sam managed to throw the ball upward from the ground at Dan with an initial velocity of 96 feet per second. Again, the ball has acceleration $a(t) = -32$ feet per second. Does the ball hit Dan? If it doesn't, explain why. If it does, explain why. Show your work.

REGULAR OFFICE HOURS

Monday: 12:00–3:00 pm

Tuesday: 1:00–4:00 pm

7:30–9:00 pm TA Ellerman, SMUDD **204**

Wednesday: 1:00-3:00 pm

Thursday: none for Professor

7:30–9:000 pm TA Ellerman, SMUDD **207**

Friday: 12:00–2:00 pm

- Please take the time to read over your class notes this week.

- Label all computations carefully