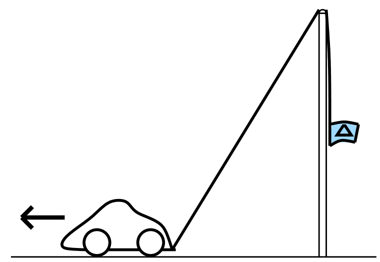
1. It is true that $Q(x) = x^5 + x^3 + x$ is a one-to-one function whose domain and range are all numbers.

a) Graph $Q(x)$ on the interval $-2 \le x \le 2$.

b) Suppose that R is the function inverse to Q. There is no simple algebraic way to compute values of R. Compute $R(3)$, $R'(3)$ and $R''(3)$.

Hint $Q(R(x)) = x$ and $R(Q(x)) = x$. So find an input to Q which will "output" 3. Then differentiate one of the equations, maybe more than once.

2. A flagpole is 40 feet high and stands on level ground. A flag is attached to a 120 foot rope passing through a pulley at the top of the flagpole. The other end of the rope is tied to a car at ground level. If the car is driving directly away from the flagpole at 3 ft/sec, how fast is the flag rising when the top of the flag is 20 feet off the ground?



3. Two curves intersect orthogonally when their tangent lines at each point of intersection are perpendicular. Suppose C is a positive number. The curves $y = Cx^2$ and $y = \frac{1}{x^2}$ intersect twice. Find C so that the curves intersect orthogonally. For that value of C, sketch both curves when $-2 \le x \le 2$ and $0 \le y \le 4$.

4.* Two trains leave a station at $t = 0$ and travel with constant velocity v along striaght tracks that make an angle θ.

a) Show that the trains are separating from each other at a rate of $v\sqrt{2 - 2\cos\theta}$.

b) What does this formula give for $\theta = \pi$?

One problem will be selected for a writeup to be handed in at the next recitation meeting. Please see Professor Greenfield's Math 151 webpage to learn which problem to hand in.

* This is the textbook's problem 42 for section 3.11.