Problem statement 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 $-2 \leq x \leq 2$.

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.

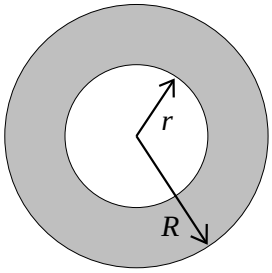
Problem Statement

Two trains leave a station at $t = 0$ and travel with constant velocity v along straight 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 $\theta = \pi$?

Problem statement Two circles have the same center. The inner circle has radius r which is increasing at the rate of 3 inches per second. The outer circle has radius R which is increasing at the rate of 2 inches per second. Suppose that A is the area of the region *between* the circles. At a certain time, r is 7 inches and R is 10 inches. What is A at that time? How fast is A changing at that time? Is A increasing or decreasing at that time?



Problem statement Find the largest circle centered on the positive y-axis which touches the origin and which is above $y = x^2$.