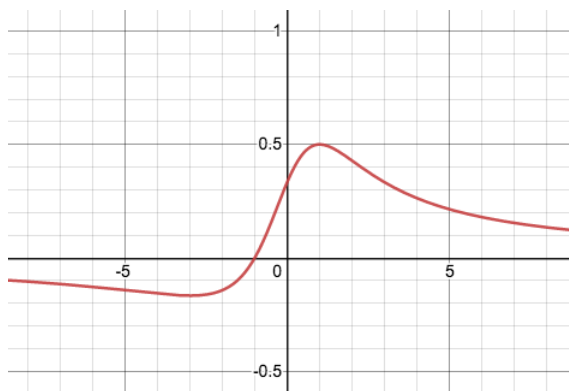# 4.2 Optimization Part 1

1. Give an example of a function that does not have a global maximum or a global minimum value.

2. Find the global maximum and minimum for $f(x) = \dfrac{x+1}{x^2+3}$ on the interval $[-1, 2]$.

3. What value of x minimizes S, where $S = 5px + 3qx^2 - 6pq$? (p and q are positive constants). Check your work using Desmos.

4. What value of t maximizes y, where $t > 0$, and $y = at^2 e^{-bt}$? (a and b are positive constants). Check your work using Desmos.

5. (Taken from Hughes-Hallett, et. al.) When you cough, your windpipe contracts. The speed, v, at which the air comes out depends on the radius, r, of your windpipe. If R is the normal (rest) radius of your windpipe, then for $0 \leq r \leq R$, the speed is given by $v = a(R - r)r^2$, where a is a positive constant. What value of r maximizes the speed?