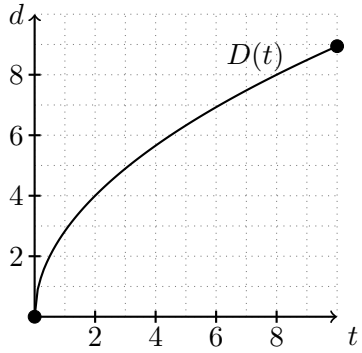
8. [5 points] Let $y = q(x) = \frac{ax}{1+ax}$, where $a > 0$ is a positive constant. Find a formula for the function $q^{-1}(y)$, showing **all** your work.

Solution:

$$y = \frac{ax}{1+ax}$$
$$y(1+ax) = ax$$
$$y = ax(1-y)$$
$$\frac{y}{1-y} = ax$$
$$x = \frac{y}{a(1-y)}$$

$q^{-1}(y) =$ $\frac{y}{a(1-y)}$.

9. [5 points] Consider the function $D(t)$ with its graph shown below on the left, and the piecewise-defined function $S(d)$.



$$S(d) = \begin{cases} 0 & d < 0 \\ -d^2 - 10d + 100 & 0 \le d \le 10 \\ 0 & d > 10 \end{cases}$$

a. [1 point] Is $S(D(t))$ invertible?

[yes] no not possible to tell

b. [4 points] Find all solutions t to the equation $S(D(t)) = 25$. Be sure to show **all** your work and, if necessary, estimate any coordinates on the graph of $D(t)$ to one decimal place.

Solution: We first solve the equation $S(d) = 25$:

$$25 = -d^2 - 10d + 100$$
$$0 = d^2 + 10d - 75 = (d-5)(d+15)$$
$$d = 5,\ 15.$$

Looking at the graph of $D(t)$, the only value of t for which $D(t) = 5$ or 25 is $t = 3.1$.

$t =$ 3.1.