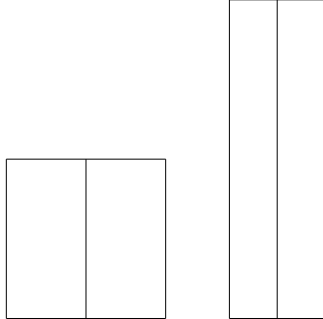


1. You want to build two enclosures using exactly 2000 meters of fencing. One enclosure will be a square, and the other will be a rectangle that is 6 times as long as it is wide. Each enclosure will be divided in half by a fence, as the picture below shows. What should the dimensions of the rectangular enclosure be in order to minimize the combined area of the two enclosures? What dimensions maximize the combined area of the two enclosures?



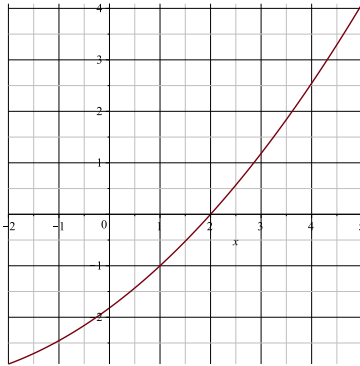
**Problem 1** Let  $f(x) = -(x - 1)^2 + 10$  and  $g(x) = \frac{x}{x+1}$ .

a)(5 points) Compute  $f(g(x))$

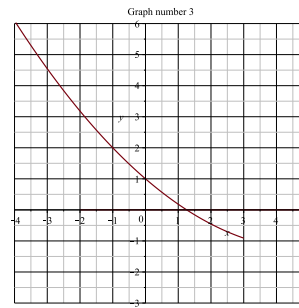
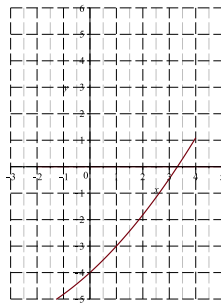
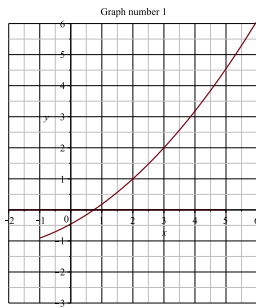
b)(5 points) Find an inverse for  $f(x)$  on the domain  $x \leq 1$

c)(5 points) Suppose that  $f(x)$ , for  $0 \leq x \leq 1$ , gives you the altitude, at time  $x$ , of a ball that has been launched in the air. Time  $x$  is measured in seconds and altitude  $f(x)$  in meters. Explain in words the meaning of  $f^{-1}(0.5)$  (You do not need to compute the value of  $f^{-1}(0.5)$  )

2. Below is the graph of the function  $y = f(x)$  on the domain  $-2 \leq x \leq 5$



(a) Which of the graphs below is the graph of  $y = 2 + f(x - 1)$ ? Circle the correct graph.



(b) If the domain of  $f$  is  $-2 \leq x \leq 5$  what is the domain of the function  $\frac{f(3x)+5}{x-1}$ ?

(c) Compute  $f^{-1}(-1)$

(d) If  $h(x) = e^{f(x)}$  Which of the values below is closest to  $h^{-1}(2)$ ? Circle the the right answer.

0.6, -1, 2.5, -2, 3.5

1. Mary has spiders and flies in her house. Yesterday she counted 5 spiders. The spider population increases 3% every week. Today Mary had 15 flies in her house; the flies population doubles every 5 days. When will there be 20 times more flies than spiders in Mary's house ?

2. Write a formula for the function whose graph is the graph of  $f(x) = 3(x + 1)^2$  first shifted horizontally 5 units to the right, then scaled of a factor of  $\frac{1}{2}$ , then reflected around the  $x$  axis, then moved up 3 units.

Write a formula for the function whose graph is the graph of  $f(x) = 3(x + 1)^2$  first scaled of a factor of  $\frac{1}{2}$ , then shifted horizontally 5 units to the right, then reflected around the  $x$  axis, then moved up 3 units.