Math 101(04) Solution
Quiz 1 20 September 2001

1. A barometer at sea level reads 30 in of mercury. The same barometer is carried (in a balloon, say) to an altitude of 6000 ft, where it reads only 24 in of mercury. Assuming a linear model is appropriate, find A, the altitude above sea level, as a function of h, the reading on the barometer. (This lets you use the barometer as an altimeter, in case you forgot to bring your altimeter today.)

   Solution: We have $A(30) = 0$ and $A(24) = 6000$. Assuming that $A(h) = mh + b$, we find that

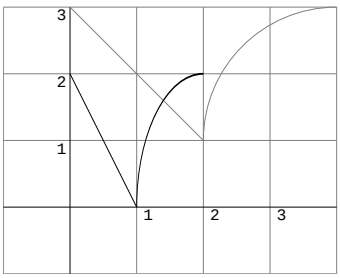
$$\begin{aligned} m &= \frac{0 - 6000}{30 - 24} \\ &= -1000. \end{aligned}$$

   To find b, we use the fact that

$$\begin{aligned} 0 &= A(30) \\ &= -1000(30) + b \end{aligned}$$

   so $b = 30000$. The function we're after is $A(h) = 30000 - 1000h$.

2. The graph of a function f is shown in the grid below. On the same grid, sketch the graph of a function g given by $g(x) = f(2x) - 1$.



   To obtain the graph of g, we compress the graph of f horizontally by a factor of two, and then translate it down one unit.

3. Let $f(x) = 3x^2 - x$ and $g(x) = \sqrt{x-1}$. Find a simple formula for $f \circ g$.

   Solution: We have

$$\begin{aligned} f \circ g(x) &= f(g(x)) \\ &= f(\sqrt{x-1}) \\ &= 3(\sqrt{x-1})^2 - \sqrt{x-1} \\ &= 3(x-1) - \sqrt{x-1}. \end{aligned}$$