Math 110 - Section 8
Quiz #2
Solutions

1. Given that $f(x) = x^2 - 5.$ and $g(x) = \sqrt{2x+6}$,

   (a) Find $\left(\frac{f}{g}\right)(x)$ and state it's domain.

   $$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{x^2-5}{\sqrt{2x+6}}$$

   To find the domain we have to make sure that the square root is defined, and that we're not dividing by zero. So $2x + 6 > 0$, or in other words $x > -3$. Note that we're not including the possibility of $x = -3$ because then we would divide by zero. So the domain is $(-3, \infty)$.

   (b) Compute $(f \circ g)(x)$ and $(g \circ f)(x)$.

   $$(f \circ g)(x) = f(g(x)) = f(\sqrt{2x+6}) = (\sqrt{2x+6})^2 - 5 = 2x + 1$$
   $$(g \circ f)(x) = g(f(x)) = g(x^2-5) = \sqrt{2(x^2-5)+6} = \sqrt{2x^2-4}$$

2. Let $f(x) = \dfrac{|x|^2}{|x|-5}$. Find g, h so that $f(x) = (g \circ h)(x)$. (Note: You may NOT use $g(x) = x$ or $h(x) = x$).

   Let $h(x) = |x|$ and $g(x) = \dfrac{x^2}{x-5}$, then $(g \circ h)(x) = g(h(x)) = g(|x|) = \dfrac{|x|^2}{|x|-5}$

3. Why does the general form of a line account for more lines? (Be specific). Hint: What type of lines are missing from the other forms?

   (Recall that in math a line means a straight line). Most lines are written $y = mx + b$, which works when y is a function of x. However, the most general form, $Ax + By + C = 0$ allows for lines which are not functions (just let $B = 0$). So for instance $x = 2$ is a line but not a function, and clearly can't be written $y = mx + b$.

4. Write $f(x) = \frac{1}{4}x^2 + x$ in standard form.

   $$f(x) = \frac{1}{4}x^2 + x = \frac{1}{4}(x^2+4x) = \frac{1}{4}(x^2+4x+4-4) = \frac{1}{4}(x^2+4x+4) - 1 = \frac{1}{4}(x+2)^2 - 1$$