1. Let $f(x) = -x^2 + 2x + 1$.
   (a) Write out $f(2)$, $f(t)$, and $f(x+h)$.
   (b) What do we call this kind of function? Without using a calculator, find the vertex.
   (c) Plot the points $(x, f(x))$ for $x = -1, 0, 1, 2$ and draw a sketch of the graph of $f(x)$.
   (d) Find the slope of the line containing the points ((-1, f(-1)), (0, f(0))) and the slope of the line containing the points (1, f(1)) and (2, f(2)).
   (e) Write a formula in terms of x for the slope of the line containing the vertex and the point (x,f(x)).

2. Given two functions f and g, we define the composite function $f \circ g$ by $(f \circ g)(x) = f(g(x))$. Let $f(x) = \sqrt{x}$, $g(x) = x + 3$, $h(x) = sin(x)$.
   (a) Let $f(x) = \sqrt{x}$, $g(x) = x + 3$. Find the functions $f \circ g$ and $g \circ f$. Find $(f \circ g)(2)$ and $(g \circ f)(2)$
   (b) Is function composition associative? That is, is it true or false in general that $(f \circ g) \circ h = f \circ (g \circ h)$?
   (c) A function $f(x)$ is called even if $f(-x) = f(x)$ for all x. What does that mean graphically?. If $f(x)$ is an even function, is it true that $f \circ g$ must be an even function? (As with any true/false question, if true, explain why, if false, give a counter-example).

3. Inverse functions:
   (a) Define a function. Can you describe this in more than one way? How can you tell if a graph is a function?
   (b) Given a function $f(x)$, define its inverse function. What conditions are needed for the inverse function to exist (i.e. to be a function)?
   (c) Does the function x^2 have a (global) inverse function? Can you restrict its domain so that it does? What about the function $tan(x)$?
   (d) Find the inverse functions of the following, and state the domain on which they are valid: $g(x) = 2x - 4$, $h(x) = e^x$, $k(x) = 2^x$, $j(x) = x^3$.

4. Are the following true? If so, show why using rules of logarithms and exponents. If not, give a counter example.
   (a) $\log|ab| = \log|a| + \log|b|$
   (b) $\ln|a - b| = \frac{\ln|a|}{\ln|b|}$
   (c) $\ln(\sqrt{5}) = \frac{\ln 5}{2}$
   (d) $\log_a x = \log_a \left(b^{log_b x}\right)$