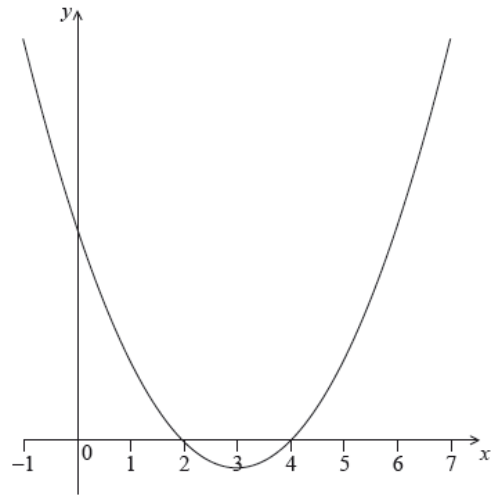
IB Mathematics A&A SL Review, Functions 1

This worksheet is due on the first class day after the Ch. 4 test (Wed., Oct. 25, for 7th pd; Thurs., Oct. 26, for 4th pd). **Work all problems on your own paper in black or dark blue ink, using pencil only for graphs or diagrams.** Problem 7 *also* asks you to draw on the graph in the question, so you will attach this handout to your work. Wherever possible, justify your answers by showing work. Numerical answers must be given exactly or to three significant figures unless otherwise specified in the problem. The assignment counts 30 points; do not wait until the last minute to do it.

1. **(no calculator)** Let $f(x) = 8x + 3$ and $g(x) = 4x$, for $x \in \mathbb{R}$.
   (a) Write down $g(2)$.
   (b) Find $(f \circ g)(x)$.
   (c) Find $f^{-1}(x)$.

2. **(no calculator)** Consider $f(x) = x^2 + qx + r$. The graph of f has a minimum value when $x = -1.5$. The distance between the two zeros of f is 9.
   (a) Show that the two zeros are 3 and –6.
   (b) Find the value of q and of r.

3. **(no calculator)** The following diagram shows part of the graph of a quadratic function f. The vertex is at (3, –1) and the x-intercepts at 2 and 4.



   (a) The function f can be written in the form $f(x) = (x - h)^2 + k$.
   Write down the value of h and of k.
   (b) The function can also be written in the form $f(x) = (x - a)(x - b)$.
   Write down the value of a and of b.
   (c) Find the y-intercept.

4. **(no calculator)** Let $f(x) = (x - 5)^3$, for $x \in \mathbb{R}$.
   (a) Find $f^{-1}(x)$.
   (b) Let g be a function so that $(f \circ g)(x) = 8x^6$. Find $g(x)$.

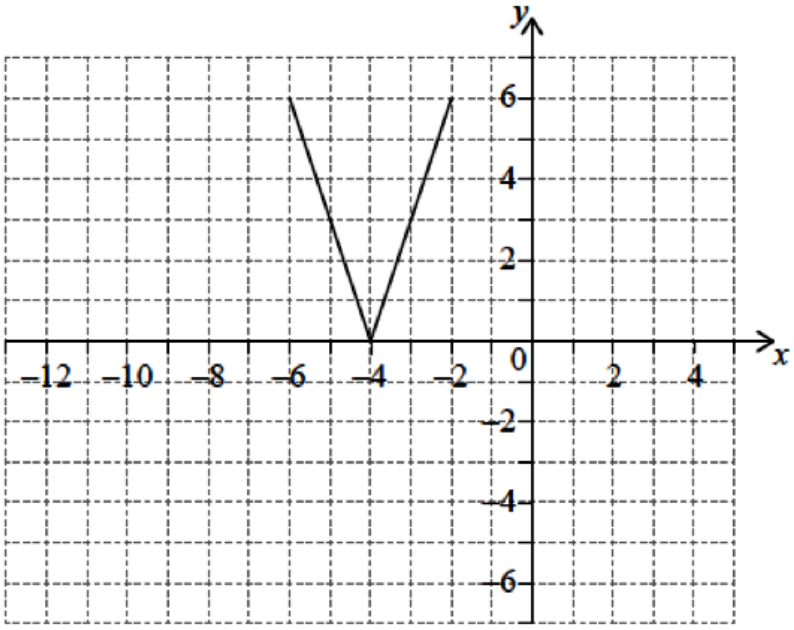
5. **(no calculator)** The equation $x^2 + (k + 2)x + 2k = 0$ has two distinct real roots. Find the possible values of k.

6. **(no calculator)** Let $f(x) = \sqrt{x-5}$, for $x \geq 5$.

(a) Find $f^{-1}(2)$.

(b) Let g be a function such that g^{-1} exists for all real numbers. Given that $g(30) = 3$, find $(f \circ g^{-1})(3)$.

7. **(calculator allowed, but no CAS features)** The following diagram shows the graph of a function $y = f(x)$, for $-6 \leq x \leq -2$. The points (–6, 6) and (–2, 6) lie on the graph of f. There is a minimum point at (–4, 0).



(a) Write down the range of f.

(b) Let $g(x) = f(x-5)$. On the grid at right, sketch the graph of g.

(c) Write down the domain of g.

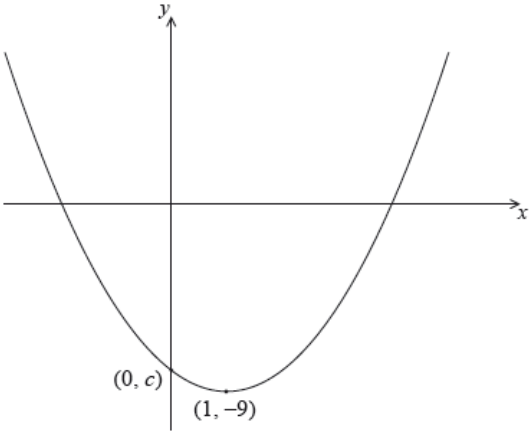
8. **(calculator allowed, but no CAS features)** Let $f(x) = x^2 + 2x + 1$ and $g(x) = x - 5$, for $x \in \mathbb{R}$.

(a) Find $f(8)$.

(b) Find $(g \circ f)(x)$.

(c) Solve $(g \circ f)(x) = 0$.

9. **(no calculator)** The following diagram shows part of the graph of a quadratic function f. The vertex is at (1, –9), and the graph crosses the y-axis at the point $(0, c)$.



(a) The function can be written in the form $f(x) = (x-h)^2 + k$.

Write down the value of h and of k.

Let $g(x) = -(x-3)^2 + 1$. The graph of g is obtained by a reflection of the graph of f in the x-axis, followed by a translation of p units horizontally and q units vertically.

(b) Find the value of p and of q.

10. **(calculator allowed, but no CAS features)** Let $f(x) = kx^2 + kx$ and $g(x) = x - 0.8$. The graphs of f and g intersect at two distinct points. Find the possible values of k.