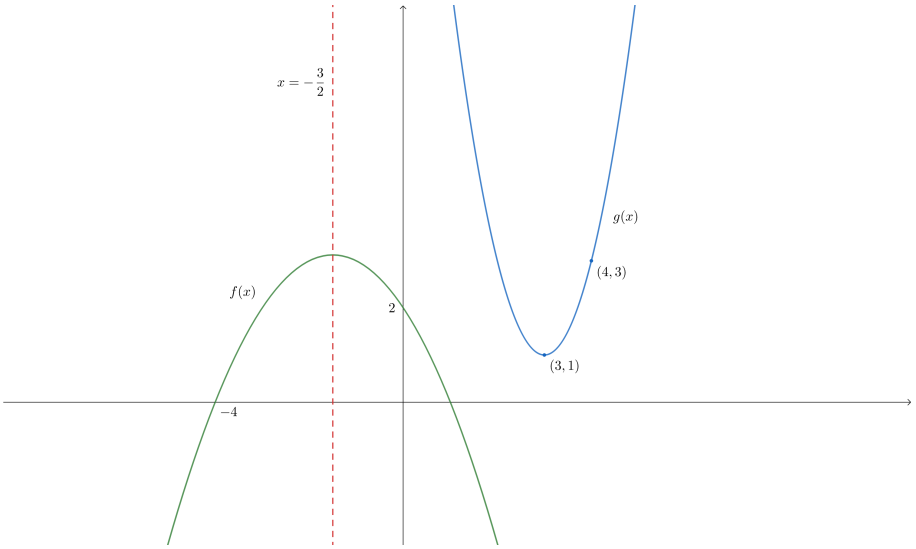
Name:
Group 2
Result:

1. The following diagram shows graphs of two quadratic functions $f(x)$ and $g(x)$.



The graph of $y = f(x)$ has one of the x-intercepts at $(-4, 0)$, y-intercept at $(0, 2)$ and the axis of symmetry at $x = -\frac{3}{2}$. The graph of $y = g(x)$ has a vertex at $(3, 1)$ and passes through $(4, 3)$.

a) Find the equations of each of the functions. [4 *points*]

b) Find a sequence of transformations that maps the graph of $y = f(x)$ onto the graph of $y = g(x)$. [2 *points*]

2. Solve the following equations and inequalities: [6 *points*]

a) $x - 3\sqrt{x-3} = 13$

b) $-x^2 - 2x - 5 \leqslant 0$

c) $\dfrac{x-2}{2x+3} \geqslant 1$

3. a) Sketch the graph of $y = \frac{1}{2}x^2 + 3x + 4$. Clearly indicate axes intercepts and the coordinates of the vertex. [2 *points*]

b) On the same set of axes sketch the graph of $y = -\frac{1}{2}x + 1$. Clearly indicate axes intercepts and the coordinates of the points of intersection of the two graphs. [2 *points*]

c) Find the possible values of m, for which a line with gradient m and y-intercept 1 is tangent to the parabola $y = \frac{1}{2}x^2 + 3x + 4$. [2 *points*]

4. Consider the equation:

$$x^2 + (m-4)x - (2m+1) = 0$$

a) Show that the equation has two distinct real solutions for all values of $m \in \mathbb{R}$. [3 *points*]

b) Let α and β be the two real solutions. Find the value of m for which the value of $\alpha^2 + \beta^2$ is minimal. [3 *points*]

5. a) A rectangle has length 2 m shorter than its width. Given that the area is 48 m^2, find the dimensions of the rectangle. [2 *points*]

b) A 100 metres of fencing is to be used to enclose two fields. One in a form of rectangle with length 2 metres smaller than width, the other in a form of a square. Find the dimensions of each field if their total area is to me: [4 *points*]

i) minimal,

ii) maximal.