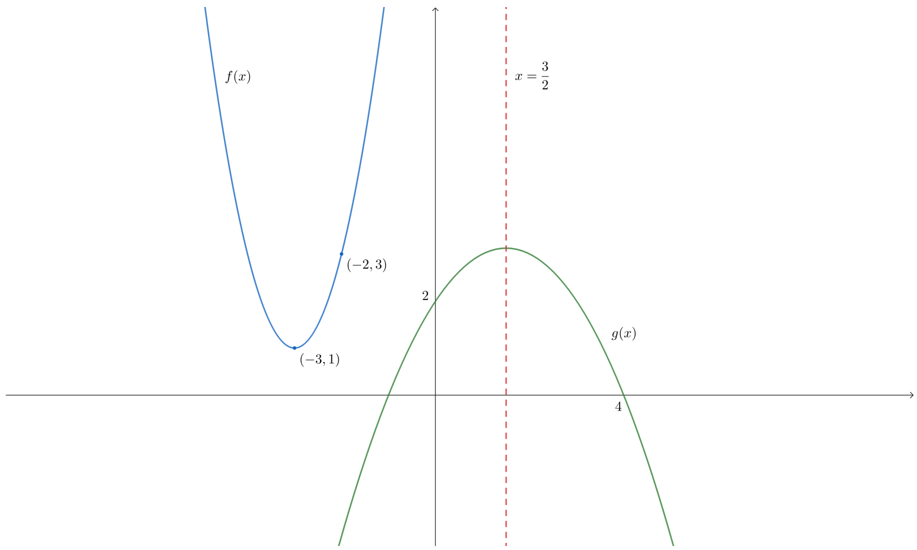
Name:
Group 1
Result:

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



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

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) $x + 2\sqrt{x-2} = 5$

b) $-x^2 + x - 3 > 0$

c) $\dfrac{x-2}{2x-1} \leqslant 1$

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:

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

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 longer than its width. Given that the area is 35 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 greater 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.