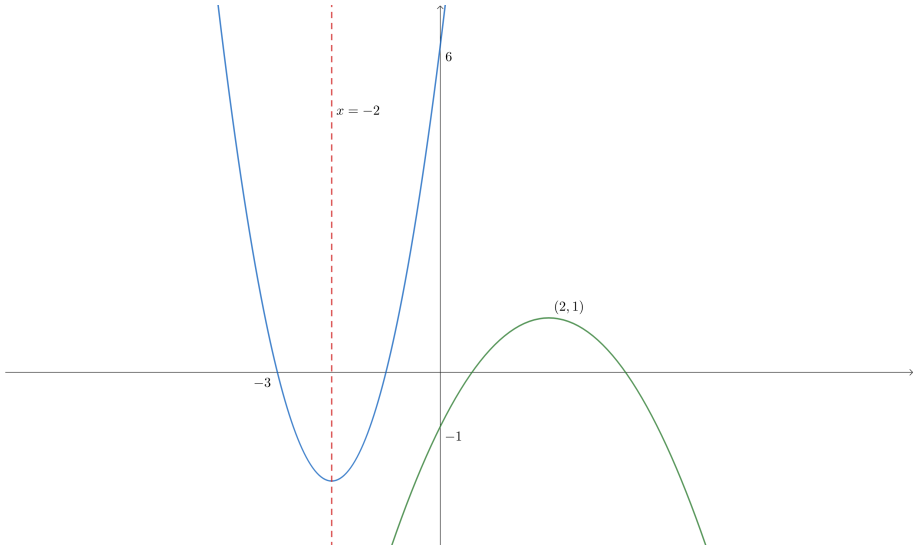
Name:
Group 1
Result:

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



The graph of $y = f(x)$ has one of the x-intercepts at $(-3, 0)$, y-intercept at $(0, 6)$ and the axis of symmetry at $x = -2$. The graph of $y = g(x)$ has vertex at $(2, 1)$ and y-intercept at $(0, -1)$

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) $x + \sqrt{x+2} = 4$

b) $4x^2 + 1 \leqslant 4x$

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

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

b) On the same set of axes sketch the graph of $y = \frac{3}{2}x - 2$. Clearly indicate axes intercepts and the coordinates of the points of intersection of the two graphs. [2 *points*]

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

4. Consider the equation:

$$-\frac{1}{2}x^2 + 2x + m^2 - 3m = 0$$

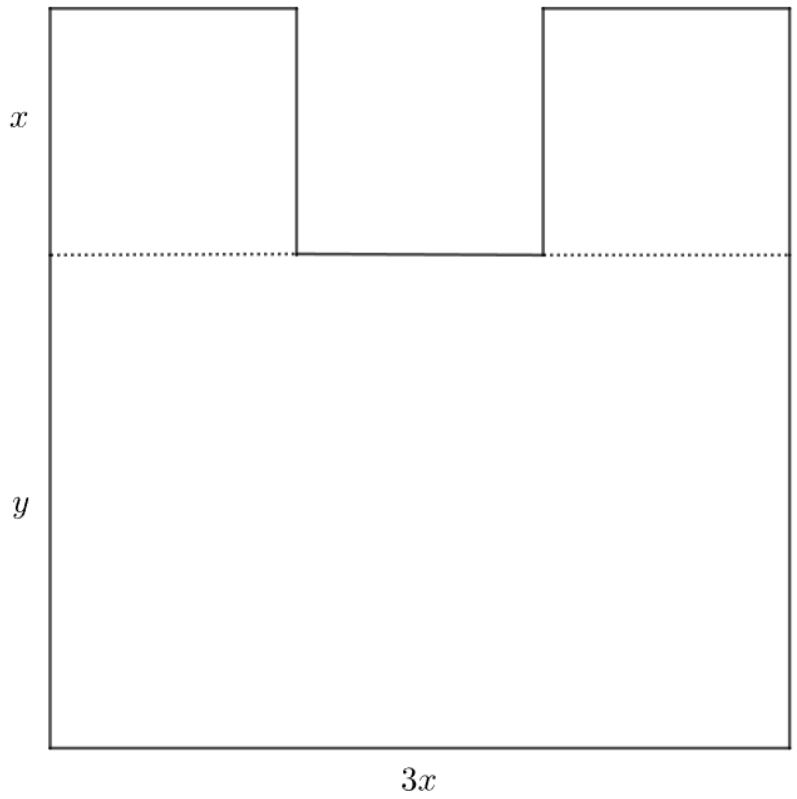
a) Find the set of all possible values of m, for which the equation above has two distinct real solutions. [3 *points*]

b) Consider the case where $m = 3$ and let the solutions to the equation be α and β.

(i) State the values of $\alpha + \beta$ and $\alpha \times \beta$.

(ii) Find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$. [3 *points*]

5. A front of a house is in the shape of a two squares on the top of the rectangle as shown below:



The width of the rectangle is 3 times the side length of the square.

a) Find the perimeter of the front if $y = 5\ m$ and the total area is $38\ m^2$. [3 *points*]

b) Given that the perimeter is $30\ m$, find the value of x which maximizes the area of the front of the house. [3 *points*]