1. Take f to be the function given by

$$f(x) = \begin{cases} 3 & \text{if } -3 \leq x < -1 \\ \left(\frac{1}{2}\right)^{x+1} + 1 & \text{if } -1 \leq x < 1 \\ -2x + 3 & \text{if } 1 \leq x < 3. \end{cases}$$

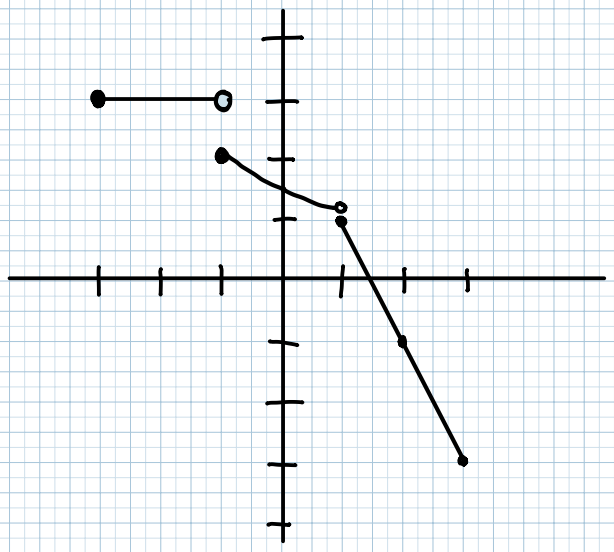
Identify its domain.

$[-3, 3)$

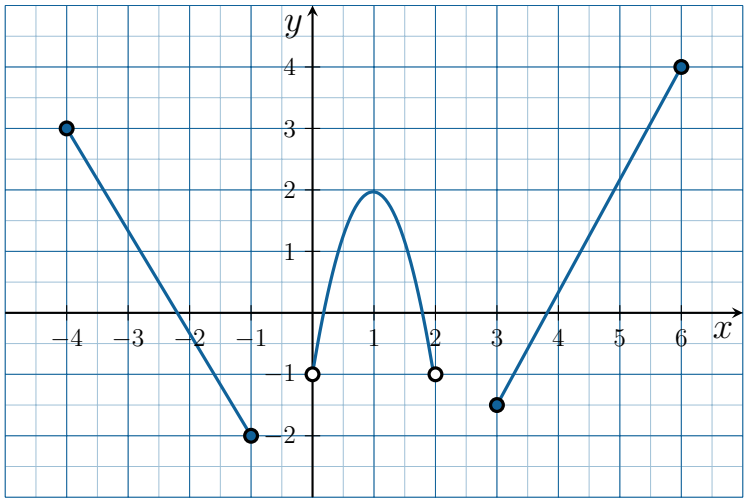
2. Take f to be the function given by

$$f(x) = \begin{cases} 3 & \text{if } -3 \leq x < -1 \\ \left(\frac{1}{2}\right)^{x+1} + 1 & \text{if } -1 \leq x < 1 \\ -2x + 3 & \text{if } 1 \leq x < 3. \end{cases}$$

Identify its domain. Sketch f.



3. Take f to be the piecewise function whose graph is given below.



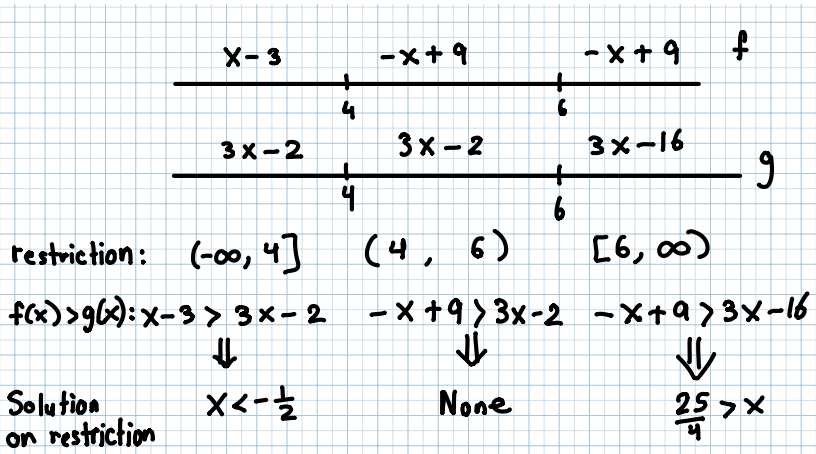
It is a piecewise function made up of linear and quadratic functions. Determine a formula for f.

$$f(x) = \begin{cases} -\frac{5}{3}(x+4)+3 & \text{if } -4 \le x \le -2 \\ -3(x-1)^2+2 & \text{if } 0 < x < 2 \\ \frac{11}{6}(x-3)-2 & \text{if } 3 \le x \le 6 \end{cases}$$

4. Take f and g to be the functions given by

$$f(x) = \begin{cases} x-3 & \text{if } x \le 4 \\ -x+9 & \text{if } x > 4 \end{cases} \quad \text{and} \quad g(x) = \begin{cases} 3x-2 & \text{if } x < 6 \\ 3x-16 & \text{if } x \ge 6. \end{cases}$$

Solve the inequality $f(x) > g(x)$ without using graphing software. Write your answer as a union of intervals.

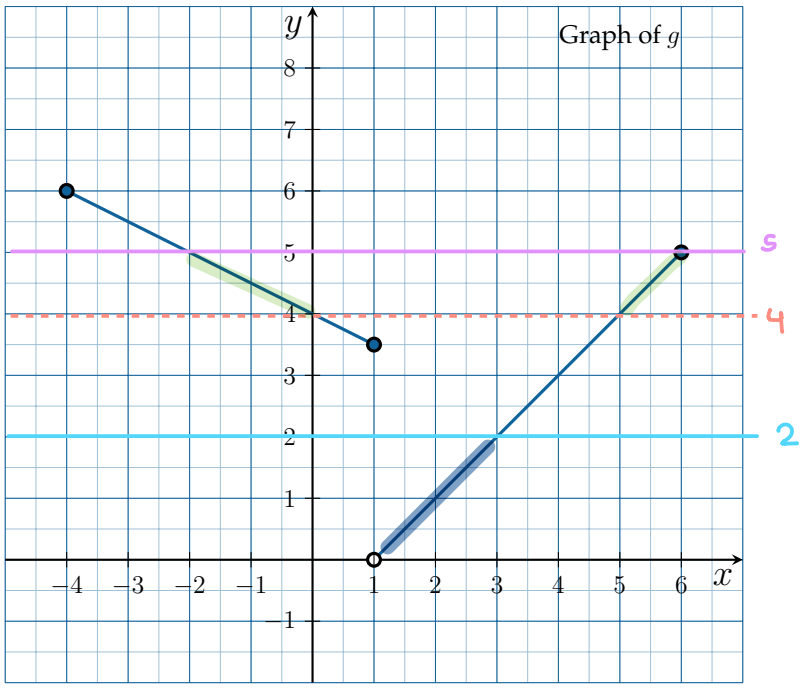


Final answer $(-\infty, -\frac{1}{2}) \cup [6, \frac{25}{4})$

5. Take f to be the function given by

$$f(x) = \begin{cases} 3x & \text{if } x \leq 2 \\ -x^2 & \text{if } 4 < x \leq 5 \end{cases}$$

and g to be the piecewise linear function whose graph is given below.



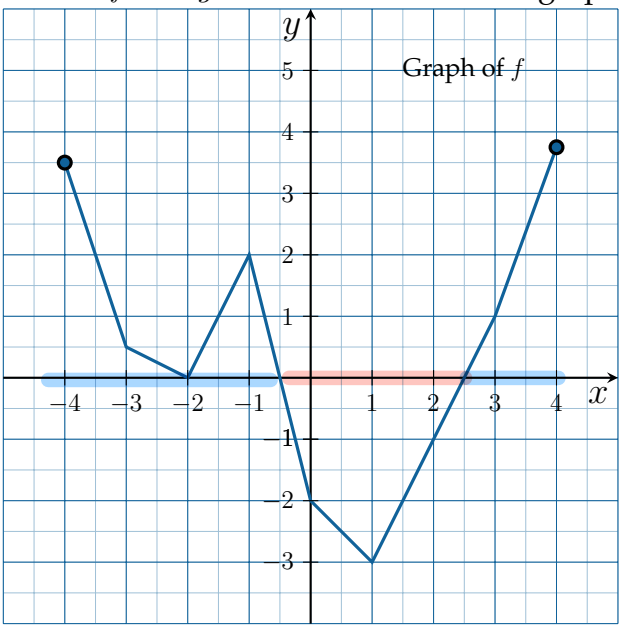
Write $f \circ g$ as a piecewise function and state its domain.

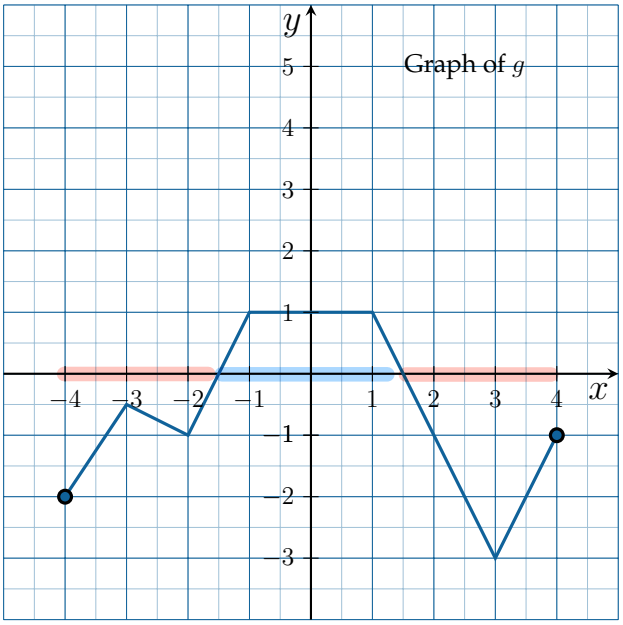
$$g(x) = \begin{cases} -\frac{1}{2}(x+4)+6 & \text{if } -4 \leq x \leq 0 \\ x-1 & \text{if } 1 < x \leq 6 \end{cases}$$

$$f(g(x)) = \begin{cases} 3g(x) & \text{if } g(x) \leq 2 \\ -(g(x))^2 & \text{if } 4 < g(x) \leq 5 \end{cases}$$

$$= \begin{cases} -\left(-\frac{1}{2}(x+4)+6\right)^2 & \text{if } -2 \leq x < 0 \\ 3(x-1) & \text{if } 1 < x \leq 3 \\ -(x-1)^2 & \text{if } 4 < x \leq 5 \end{cases}$$

6. Take f and g to be functions whose graphs are given below.



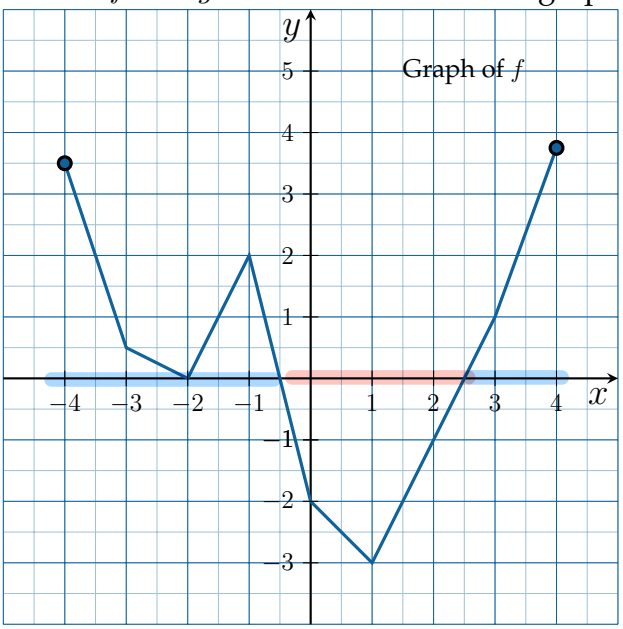


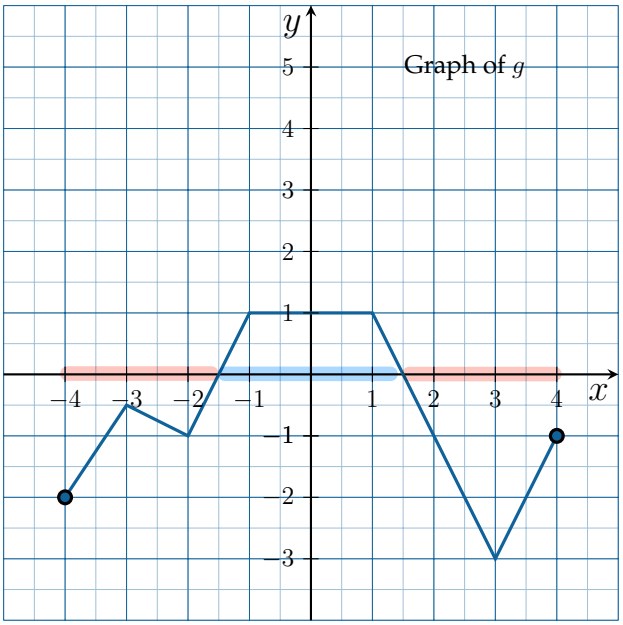
Solve the inequality $f(x)g(x) \geq 0$.

Final answer

$[-1.5,-0.5] \cup [1.5,2.5]$

7. Take f and g to be functions whose graphs are given below.





Solve the inequality $f(x)g(x) \leq 0$.

Final Answer

$[-4,-1.5] \cup [-0.5,1.5] \cup [2.5,4]$