ALL SAINTS' COLLEGE

Year 12 Mathematics Specialist 2019

Test Number 2: Functions and Graph Sketching

Resource Free

Name: _____ **Teacher: Mrs Da Cruz**

Marks: **44**

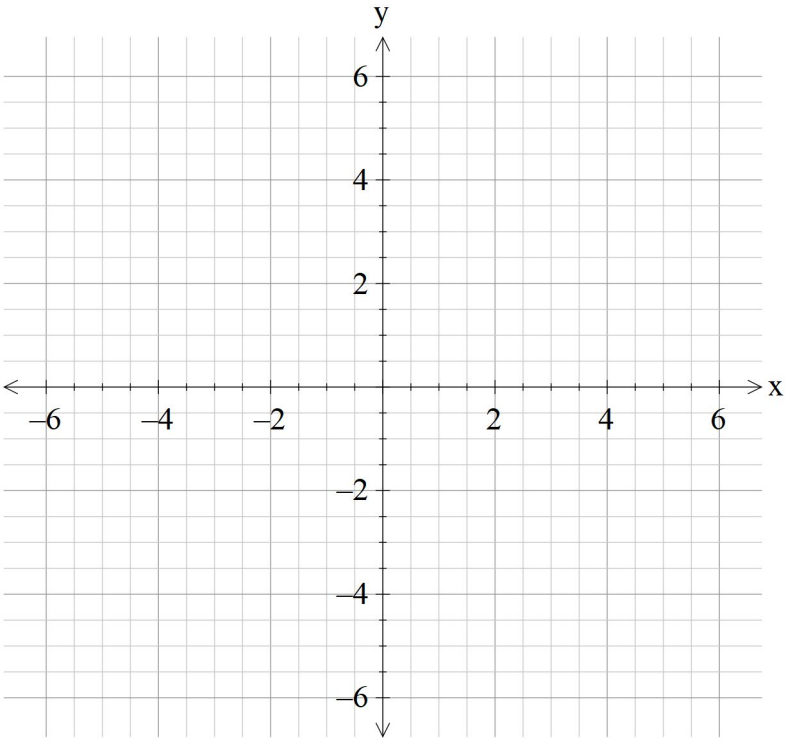
Time Allowed: **45 minutes**

Instructions: You **ARE NOT** permitted any notes or calculator. Show your working where appropriate remembering you must show working for questions worth more than 2 marks.

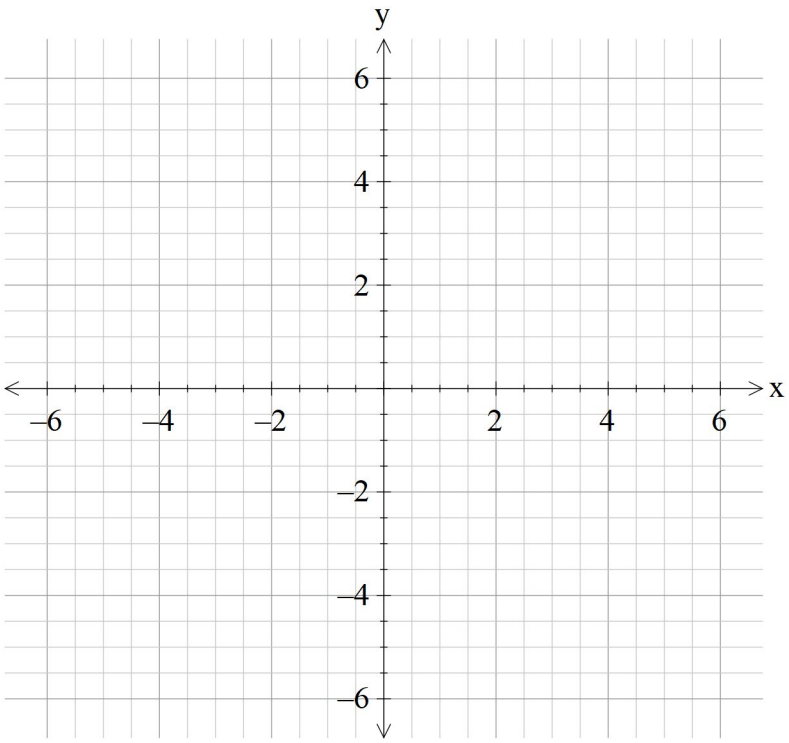
Question 1 **[3, 3, 1, 2 = 9 marks]**

Sketch the graphs of $f(x)$ and $\frac{1}{f(x)}$ on the same cartesian plane for each of the following:

a) $f(x) = -|x| + 2$



b) $f(x) = |2x + 2| + 2$



c) Use your graphs in a) and b) to help you solve the following:

i) $0 = -|x| + 2$

ii) $1 \leq |2x + 2|$

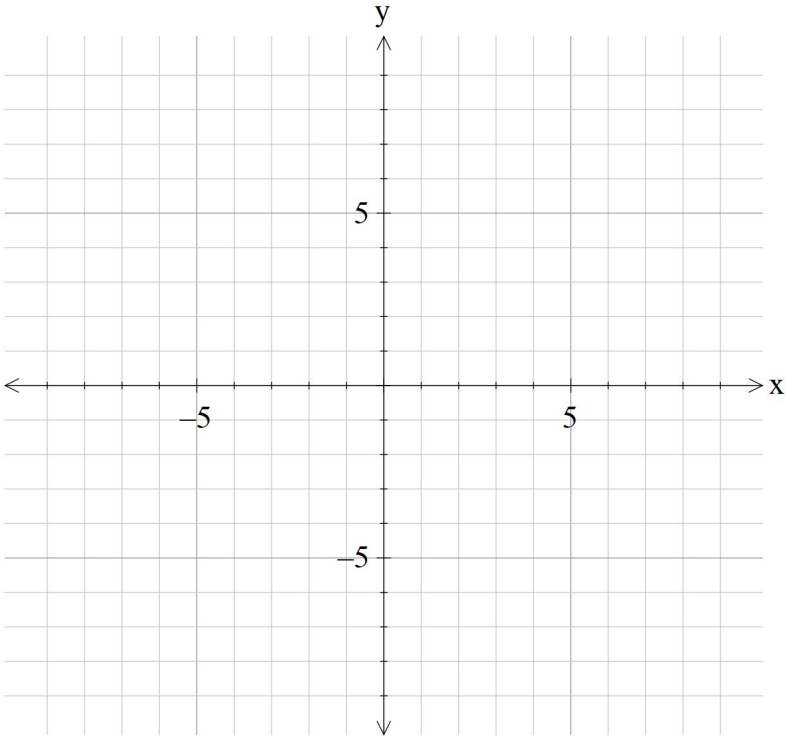
Question 2 **[3, 2, 3 = 8 marks]**

Given that $f(x) = \frac{2x-1}{3-x}$:

a) By rearranging $f(x)$ into the form $a + \frac{b}{x-3}$, find the asymptotes of $f(x)$.

b) Find the axes intercepts of $f(x)$.

c) Sketch the graph of $f(x)$.



Question 3 **[1, 4, 1, 2, 3, 1 = 12 marks]**

Given that $f(x) = -\frac{1}{x}$ and $g(x) = x^2 + 3x + 2$.

a) Find $fog(x)$.

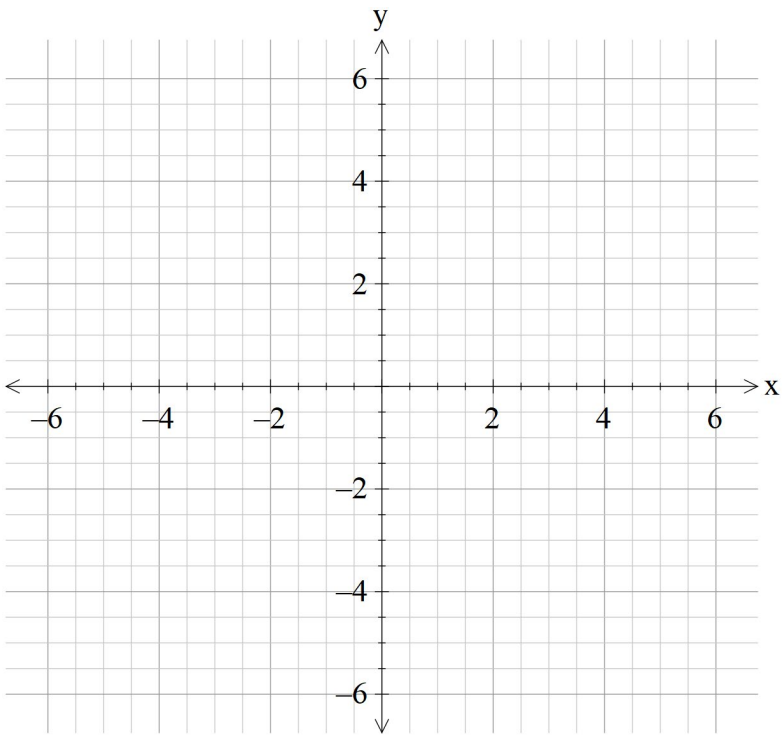
b) State the domain and range of $fog(x)$.

c) Are either of $f(x)\ or\ g(x)$ one-to-one functions? If so, state which ones.

d) Find $f^{-1}(x)$ stating any restriction on the domain of $f(x)$ if required.

e) Find $fof^{-1}(x)$ and state the domain and range of $fof^{-1}(x)$.

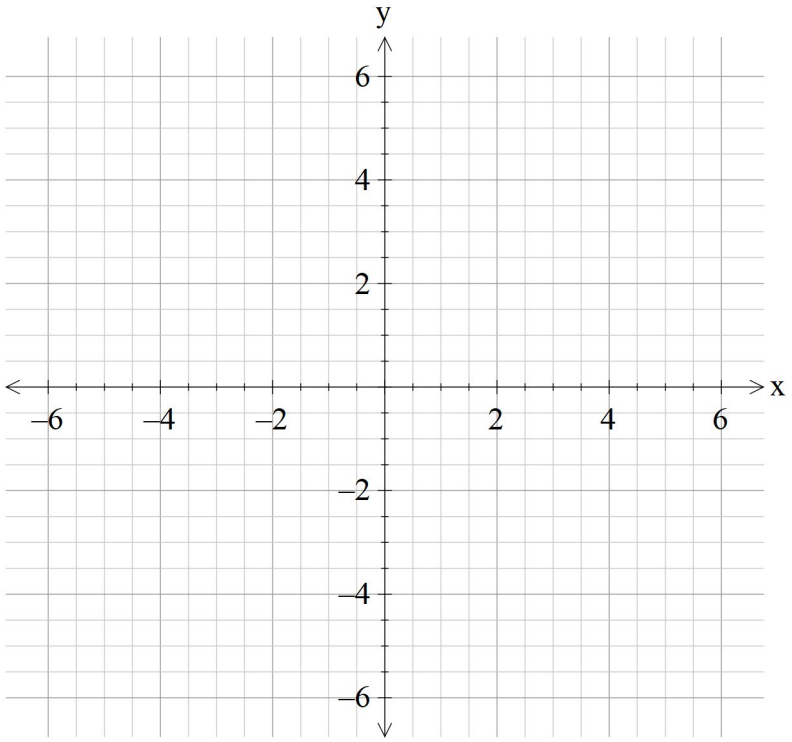
f) Sketch $fof^{-1}(x)$.



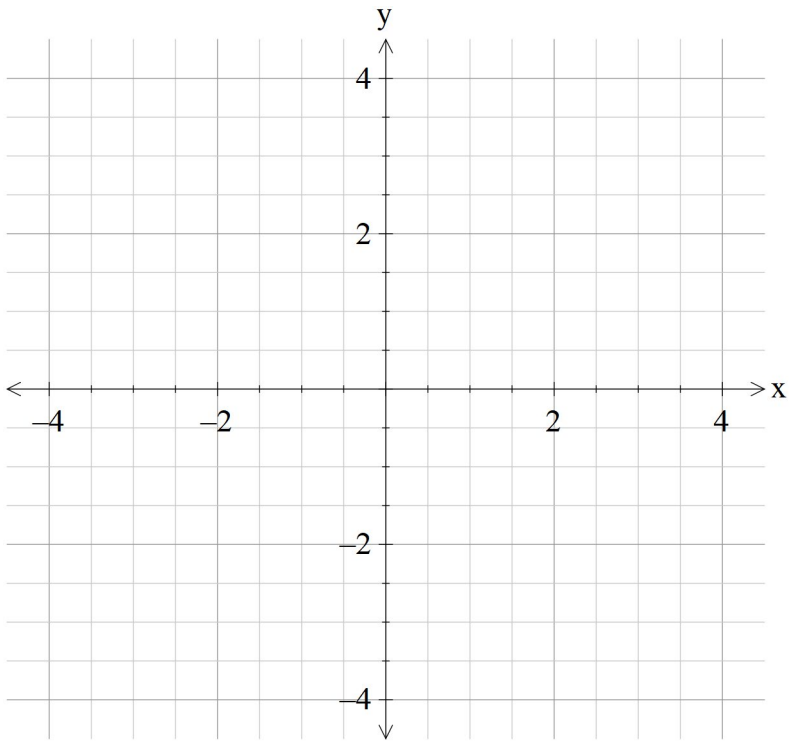
Question 4 **[2, 2 = 4 marks]**

Sketch the following functions

a) $f(x) = \frac{x^2-1}{x-1}$

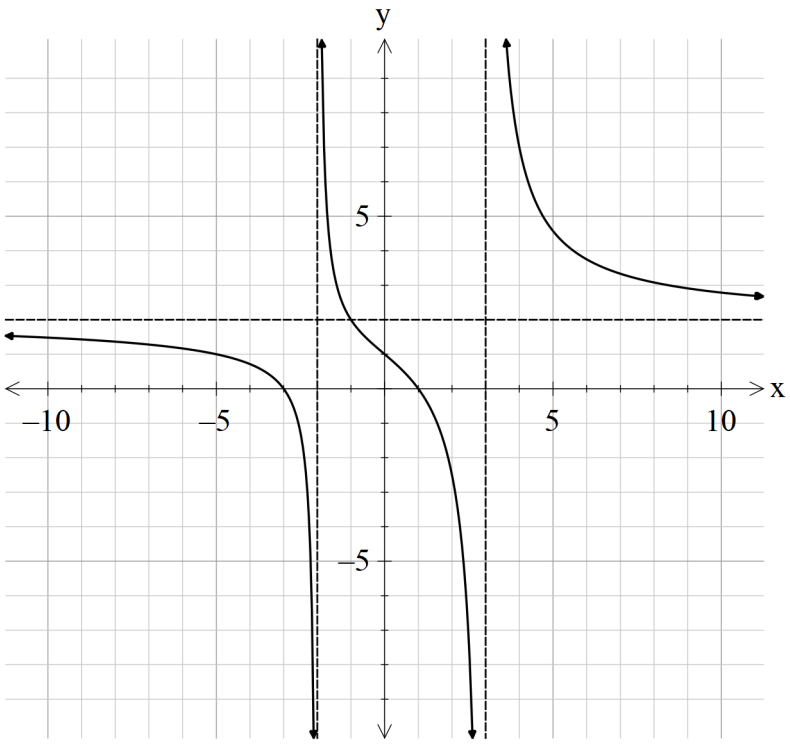


b) The piecewise function called the Sign Function: $sgn(x) = \begin{cases} 1 & x > 0 \\ 0 & x = 0 \\ -1 & x < 0 \end{cases}$



Question 5 **[4 marks]**

The graph of $f(x) = \frac{k(x-a)(x-b)}{(x-c)(x-d)}$ is shown below.



Determine the value of the constants a, b, c, d and k.

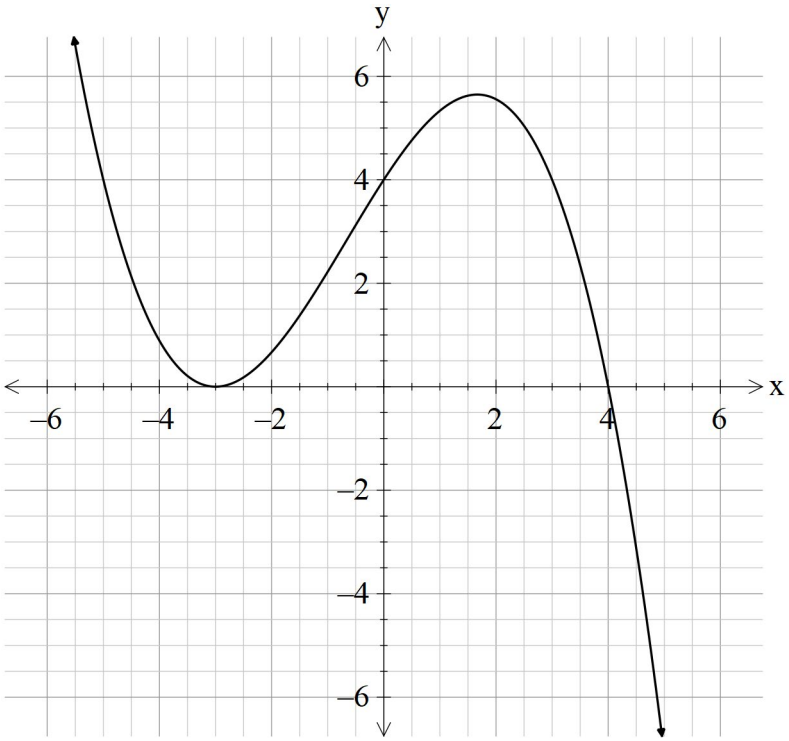
a	b	c	d	k

Explain your choice for the value of k.

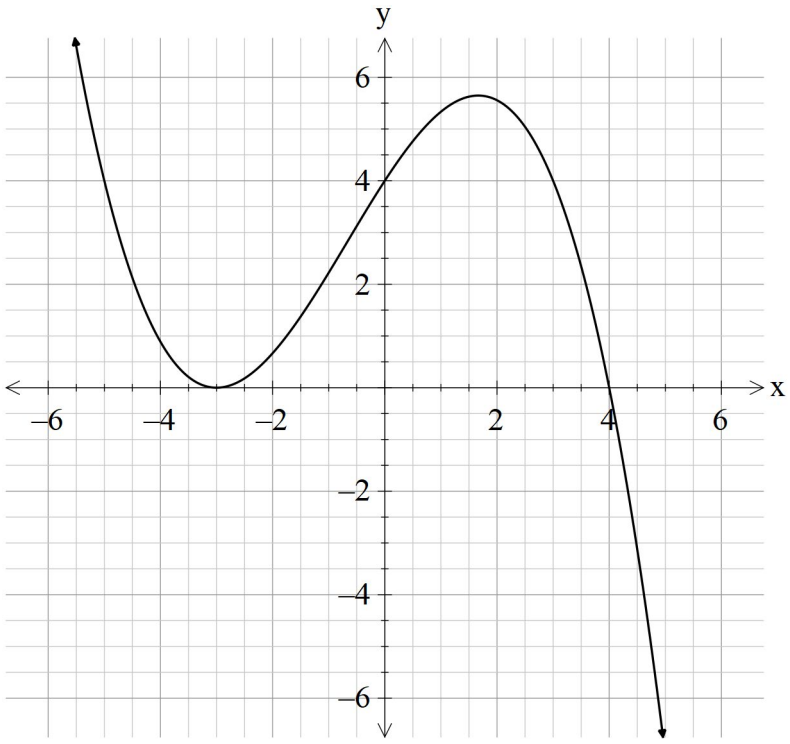
Question 6 **[2,2 = 4 marks]**

The graph of $f(x)$ appears on the graphs shown below.

Add a sketch of $f(|x|)$ onto the first graph.



Add a sketch of $|y| = f(|x|)$ onto the second graph.



Question 7 **[3 marks]**

The graph of the function $f(x) = \frac{x^2-1}{x^2-3x+2}$ is discontinuous for two values of x. Identify each of these values and show what type of discontinuity each is.