TRINITY COLLEGE

Specialist Mathematics Units 3,4
Test 1 2018

Calculator Free

Functions

STUDENT'S NAME _____

DATE: Monday 26 February **TIME:** 55 minutes **MARKS**: 55

INSTRUCTIONS:

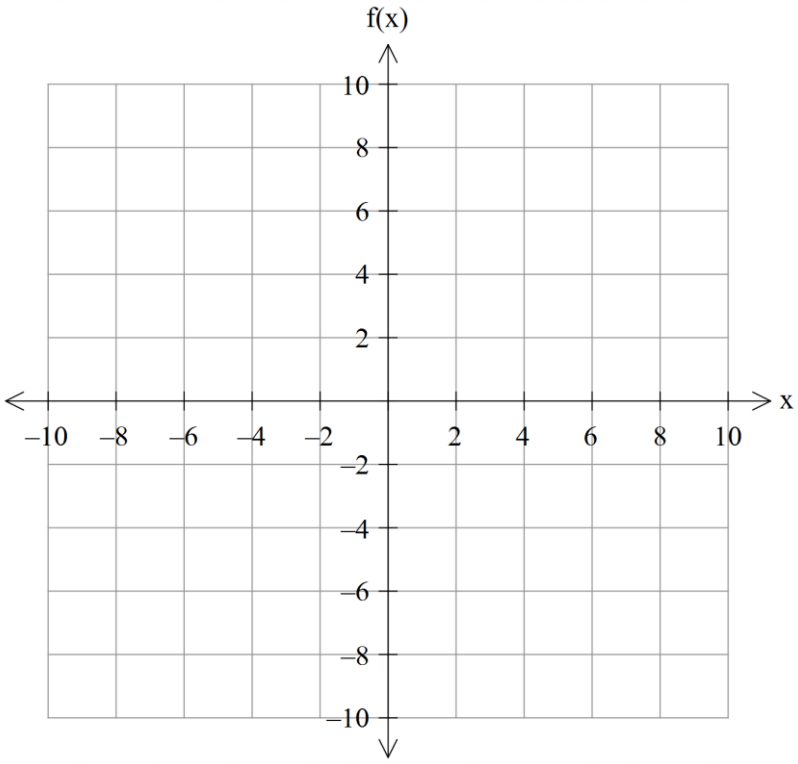
Standard Items: Pens, pencils, drawing templates, eraser, formula sheets

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

---

1. (5 marks)

Sketch $f(x) = \dfrac{x^2 - 9}{x^2 - 4}$ on the axes below.



2. (12 marks)

Solve each of the following equations.

(a) $|x+1| = 2|x-2|$ [4]

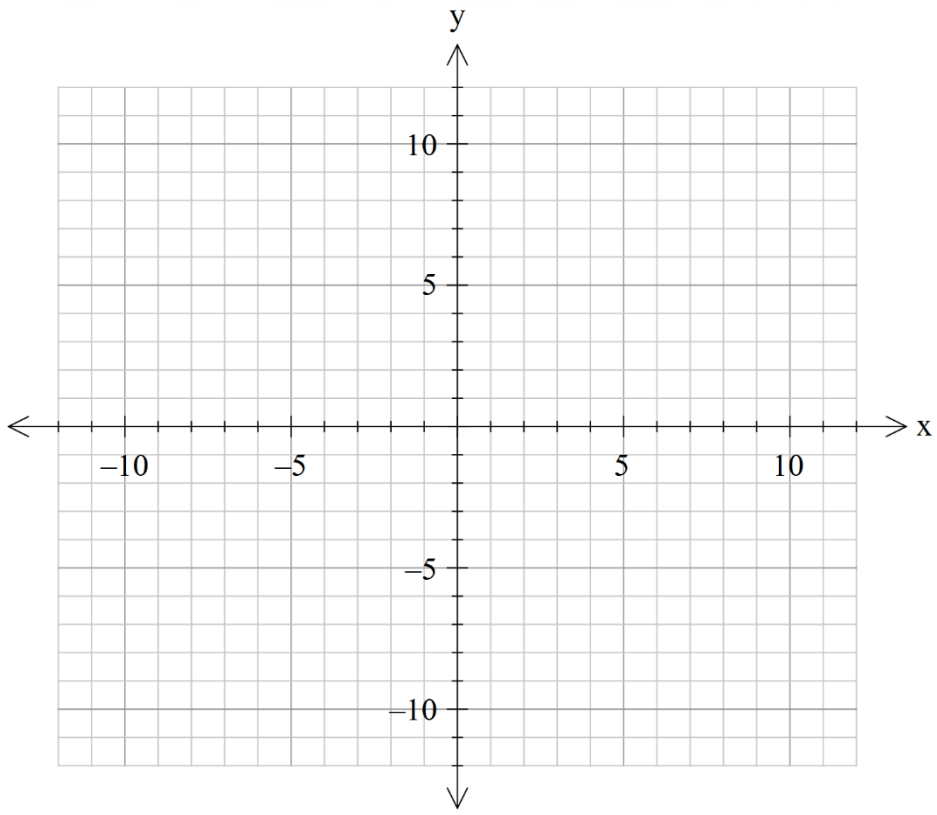
(b) $|3x-7| + 2x = 5$ [4]

(c) $\left|\frac{x+k}{x-k}\right| \geq 3$ where k is a positive constant [4]

3. (8 marks)

Given the functions $f(x) = |2x+3|$ and $g(x) = 6 - |3x|$

(a) sketch both functions on the same set of axes below. [4]

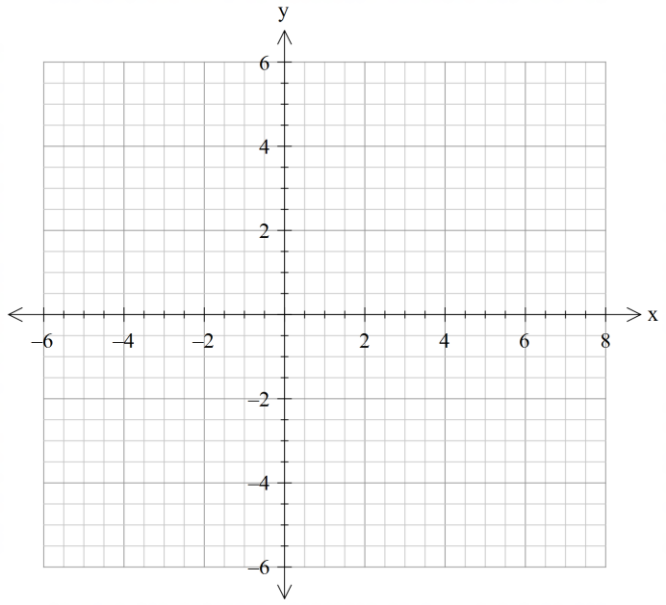


(b) Hence, or otherwise, solve $|2x+3| + |3x| < 6$ [4]

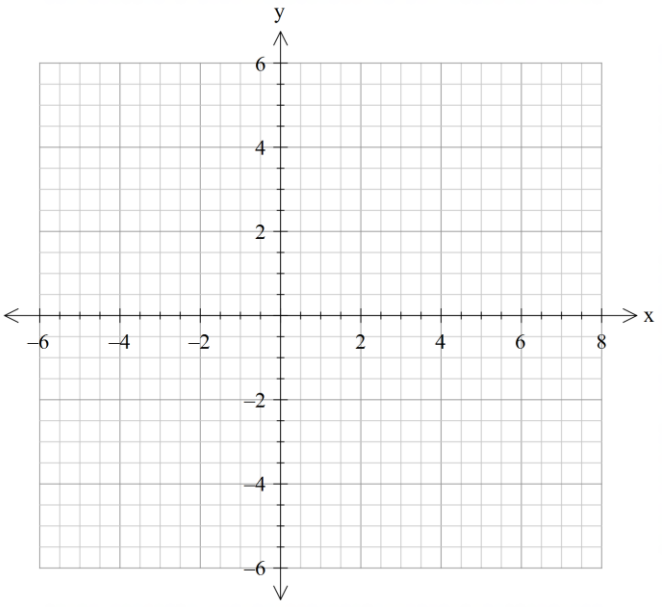
4. (7 marks)

Given $y = f(x) = |x-1| - 3$

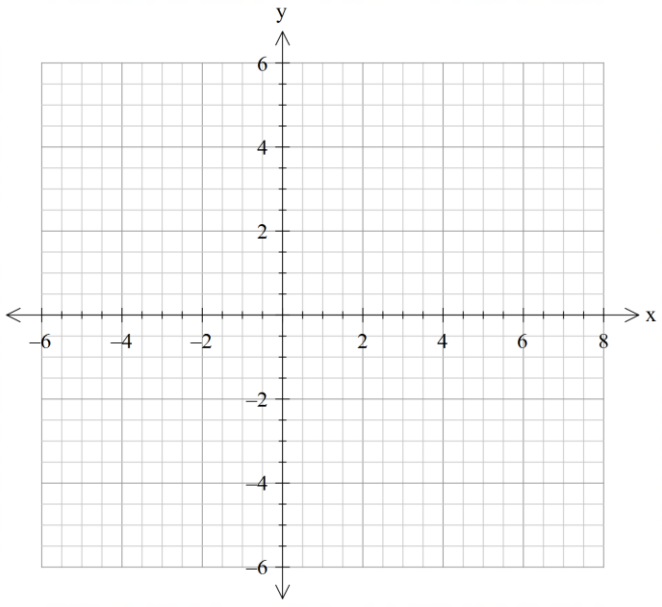
(a) sketch $y = f(x)$ [2]



(b) sketch $y = f(|x|)$ [2]



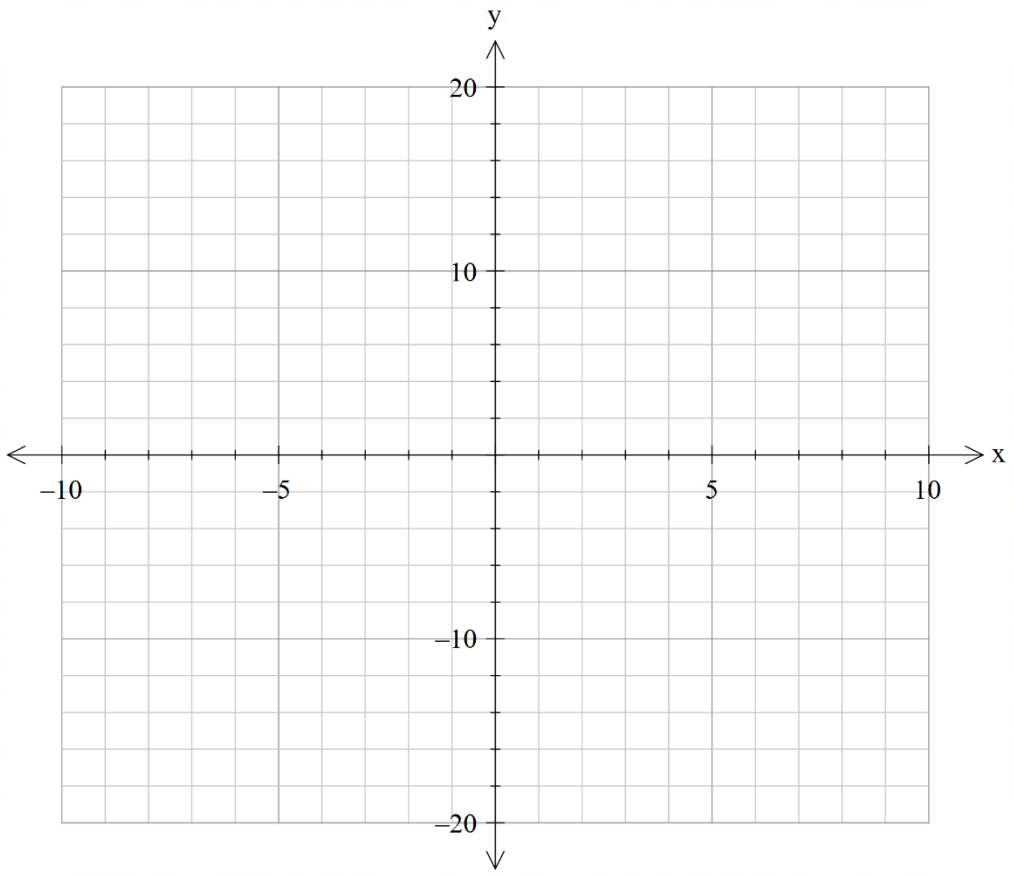
(c) sketch $y = \dfrac{1}{f(x)}$ [3]



5. (5 marks)

Sketch $y = \dfrac{(x-1)(x-2)}{x+2}$ on the axes below.

(Note – you are not required to determine the exact coordinates of any stationary points)



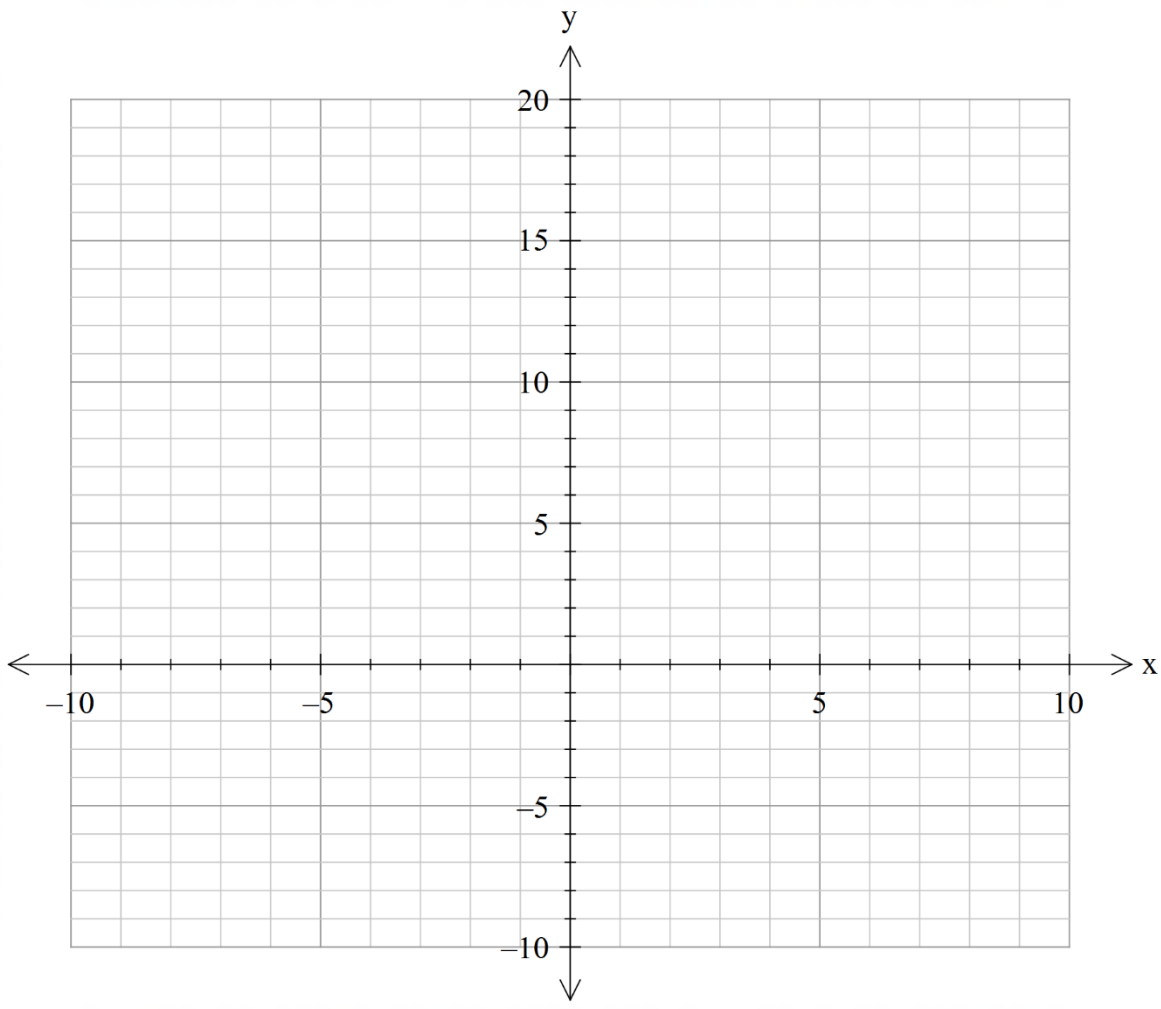
6. (5 marks)

For the two functions $f(x)=\sqrt{2x+8}$ and $g(x)=x^2+3$

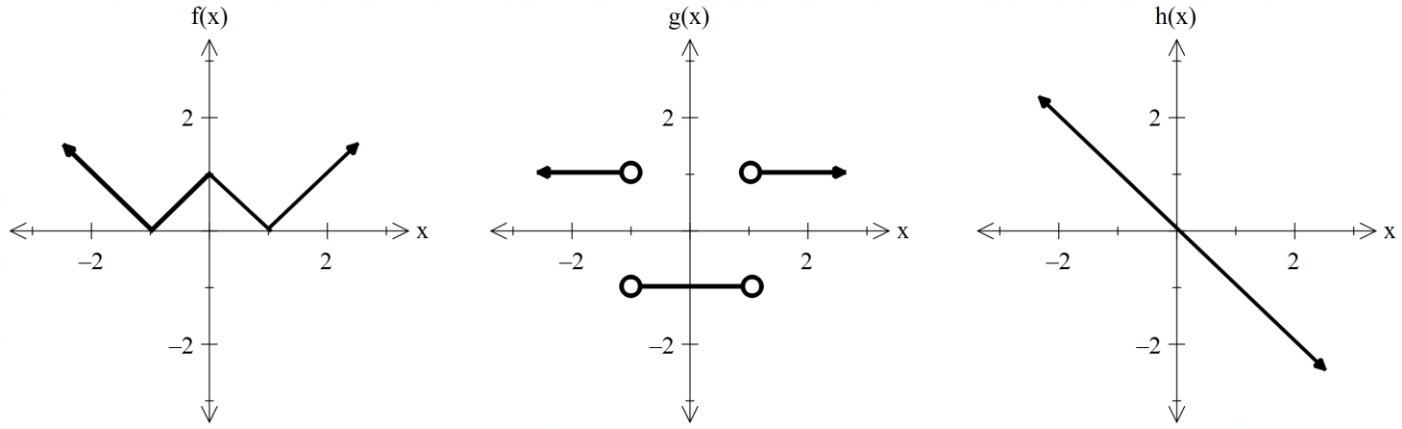
(a) determine the domain of $f(x)$ [2]

(b) determine the domain of $g\,o\,f(x)$ [1]

(c) sketch $y=g\,o\,f(x)$ [2]



7. (5 marks)



(a) Using the graphs shown above, determine

(i) $f \circ f(-1)$ [1]

(ii) $g \circ h(-1)$ [1]

(iii) $h^{-1} \circ f(0)$ [1]

(b) Determine the range of $f \circ g(x)$ [2]

8. (8 marks)

For the functions $g(x) = \frac{1}{x}$ and $h(x) = \frac{x+1}{x-1}$

(a) determine $h^{-1}(x)$ in terms of $h(x)$ [3]

(b) show $g\,o\,h(x) = h(-x)$ [3]

(c) determine $h\,o\,h(x)$ [2]