SHENTON COLLEGE

ATMAS Mathematics Specialist

Test 2 Calculator Free

Name: ……

Time Allowed : 30 minutes

Marks	/30

Materials allowed: No special materials.

Attempt all questions.
All necessary working and reasoning must be shown for full marks.
Where appropriate, answers should be given in exact values.
Marks may not be awarded for untidy or poorly arranged work.

1 If $f(x) = 16 - x^2$ and $g(x) = \sqrt{x}$,

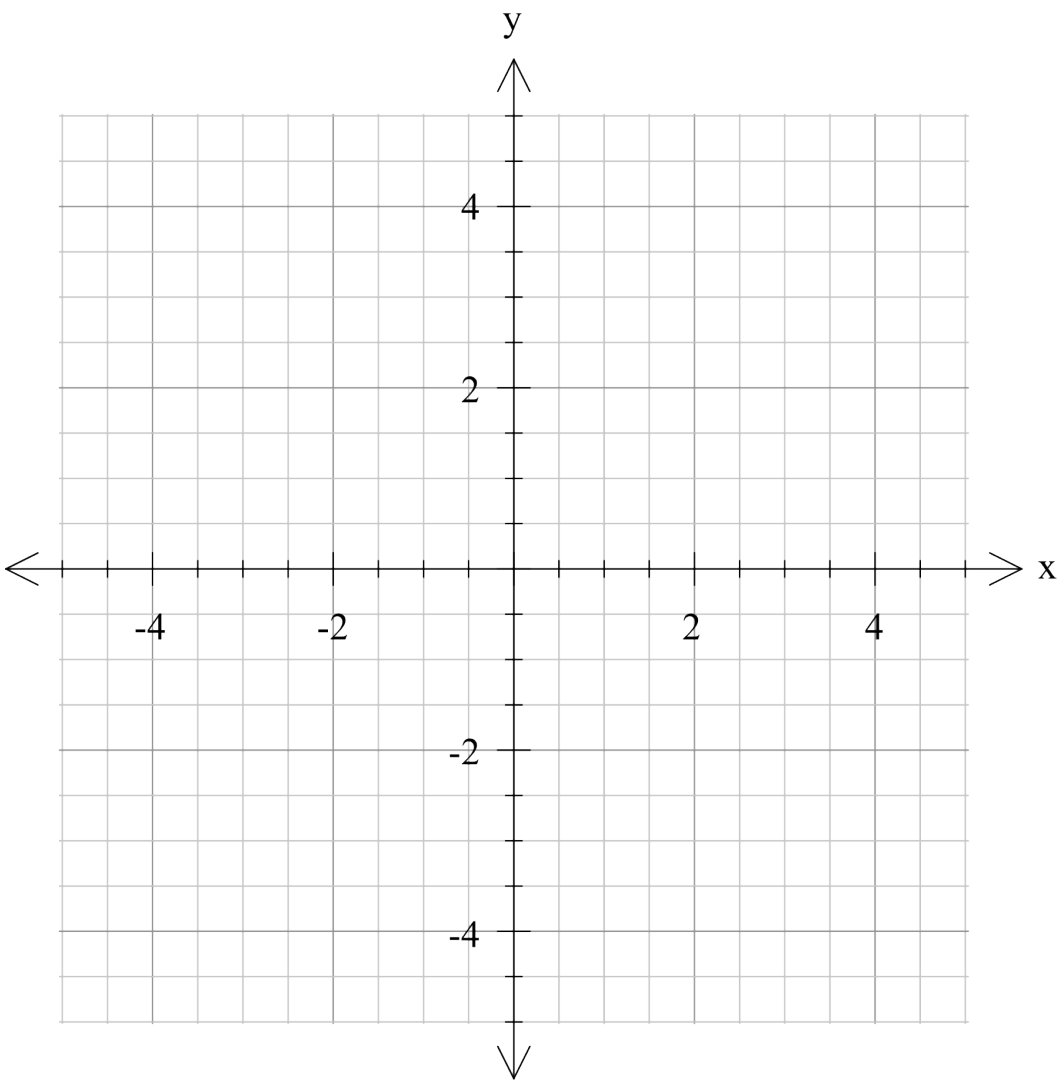
a) Determine the domain and range of the composition $g(f(x))$. (5)

b) Determine the largest domain for $f(x)$ (which includes $x = -1$) such that $f^{-1}(x)$ exists, and give the equation for $f^{-1}(x)$ on that domain. (2)

2 If $f(x) = e^x$ and $g(x) = \frac{1}{x-e}$,

a) Determine $g(f(x))$, giving the domain and range of the composition. (3)

b) Draw a sketch of the composite function $y = g(f(x))$, indicating any important features. (3)

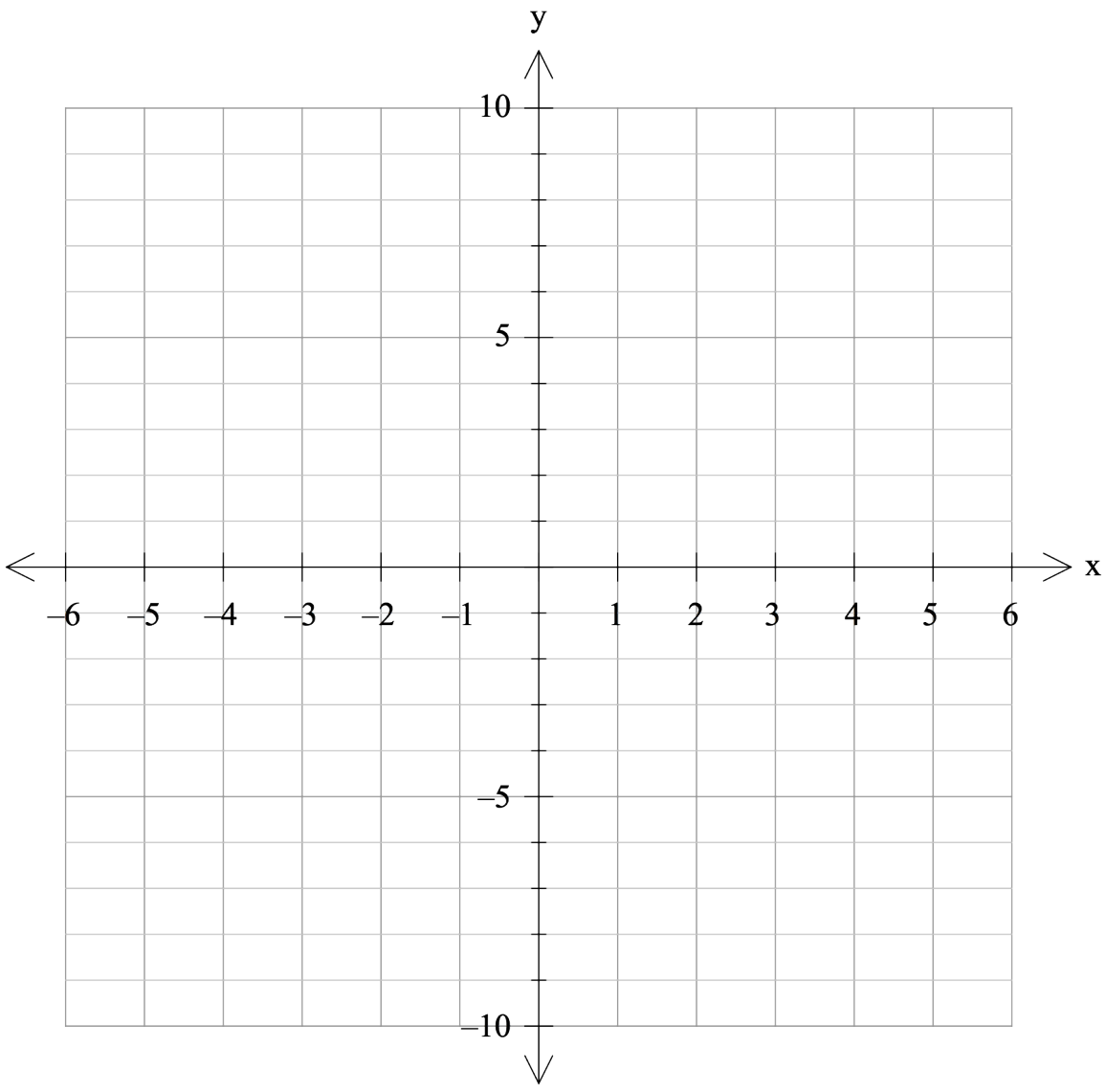


3 A function is defined using absolute value notation as $f(x) = |x + 3| - |x - 4|$

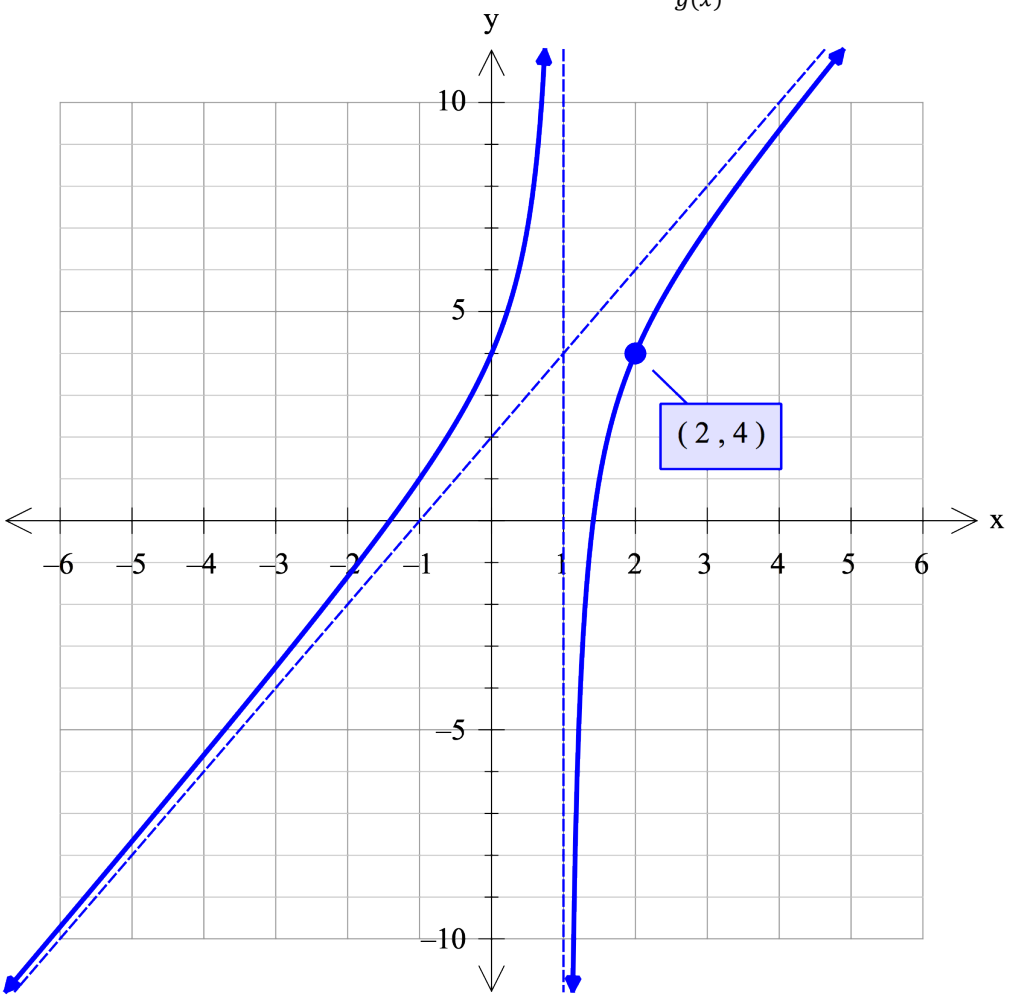
a) Complete the following piecewise definition for the function $f(x)$. (4)

$$f(x) = \begin{cases} \_\_\_\_\_ & \text{for} \quad x < \_\_ \\ \_\_\_\_\_ & \text{for} \quad \_\_ \leq x \leq \_\_ \\ \_\_\_\_\_ & \text{for} \quad x > \_\_ \end{cases}$$

b) Sketch the function $y = |x + 3| - |x - 4|$ on the set of axes below. (2)



4 The graph below was created from the function $y = \frac{f(x)}{g(x)}$.



Determine both $f(x)$ and $g(x)$. (3)

5 For a line passing through the points $\begin{pmatrix} 1 \\ 5 \\ -2 \end{pmatrix}$ and $\begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix}$, find

a) The vector equation of the line. (2)

b) The parametric equations of the line. (2)

c) The point on this line which is closest to the point $\begin{pmatrix} 4 \\ 9 \\ -4 \end{pmatrix}$. (4)