



WESLEY COLLEGE

By daring & by doing

YEAR 12 MATHEMATICS SPECIALIST
SEMESTER ONE 2016
TEST 2: Functions

Name: _____

Friday 1st April

Time: 50 minutes

Mark

/45 =

%

- Answer all questions neatly in the spaces provided. **Show all working.**
 - You are permitted to use the Formula Sheet in **both** sections of the test.
 - You are permitted one A4 page (one side) of notes in the calculator assumed section.
-

Calculator free section

Suggested time: 30 minutes

/28

1. [11 marks]

$$f(x) = x^2 - 1 \quad g(x) = \sqrt{9 - x}$$

Two functions f and g are defined by _____ and _____

a) Evaluate $g \circ f(\sqrt{6})$

[2]

b) What is the range of $y = f(x)$ when $x \in \mathbf{R}$?

[1]

c) What is the natural domain of $y = g(x)$

[2]

d) Predict the domain and range for $y = g^{-1}(x)$

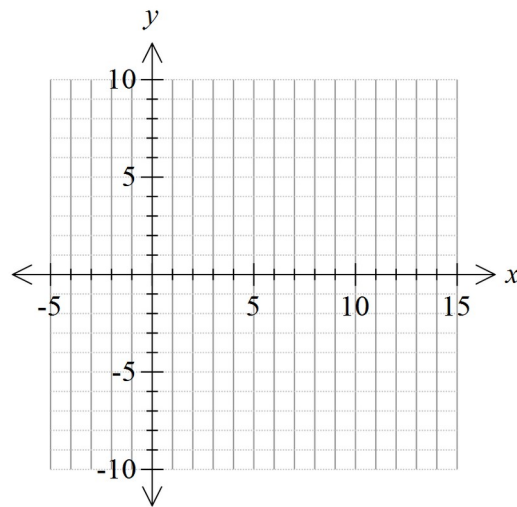
[2]

e) Determine $y = f \circ g(x)$, including all domain restrictions

[2]

- f) Sketch $y = f \circ g(x)$ and clearly indicate the range of this composite function.

[2]



2. [17 marks]

Consider the rational function
$$h(x) = \frac{2x^2 - 4x}{x^2 + x - 6}$$

- a) Identify and classify all points of discontinuity

[4]

- b) List the asymptotes (horizontal and vertical)

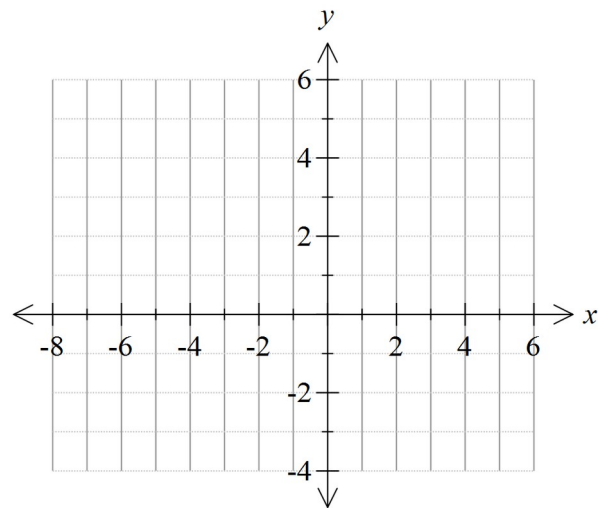
[2]

- c) Determine all intercepts

[2]

d) Sketch $y = h(x)$

[3]



e) Does $y = h(x)$ possess an inverse function $y = h^{-1}(x)$? How do you know?

[2]

f) Show algebraically that $h^{-1}(x) = \frac{3x}{2-x}$ and identify appropriate restrictions on the domain and range. Use a simplified expression for $y = h(x)$ in your calculations.

[4]

Name: _____

3. [5 marks]

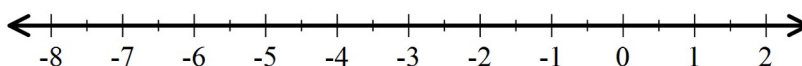
Mark solutions to these equations on the number lines provided.

In (b), clearly explain clearly how to use distance considerations in determining the solution.

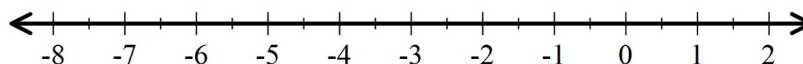
a) $|x + 3| = 4$

[1]

b)



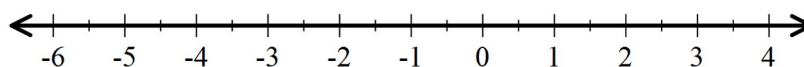
$|x + 3| + |x - 1| = 4$



[3]

c) $|x + 3| + |x - 1| = 8$

[1]



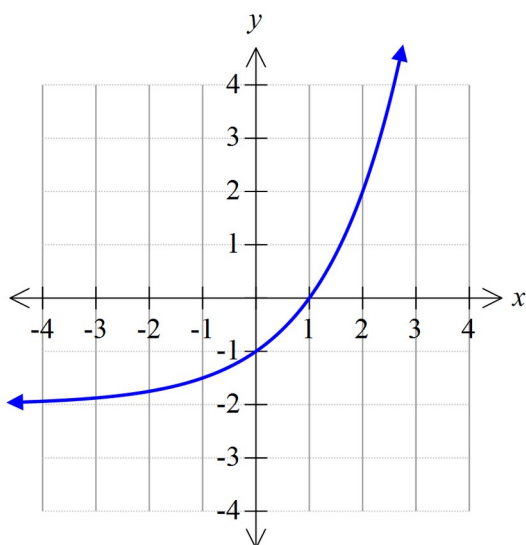
4. [5 marks]

$y = f(x)$

$y = \frac{1}{f(x)}$

$y = f(|x|)$

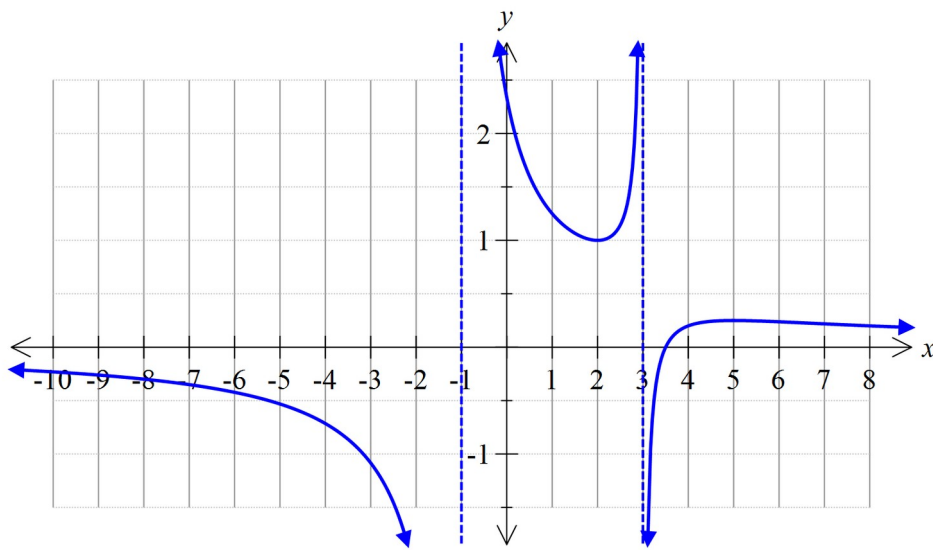
The graph of $y = f(x)$ is shown. Add the graphs of $y = \frac{1}{f(x)}$ and $y = f(|x|)$.



5. [7 marks]

$$y = f(x) = \frac{ax + b}{x^2 + cx + d}$$

This graph represents a function of the form



(2,1)

The vertical asymptotes are as shown, the x -intercept is (3.5, 0) and one turning point is at .

(a) Determine the values of the constants a , b , c and d .

[5]

$$y = f(x)$$

(b) What is the range of ?

[2]

