89%

1.

$\frac{68}{76}$

MHF – 4U **TEST # 1** [redacted]

Part A – Knowledge & Understanding (25)

24
28
10
6

1. For each relation state the domain, range and whether it is a function or not.

(3) a) f = { (1,2) , (3,4) , (5,2) , (6,7) }

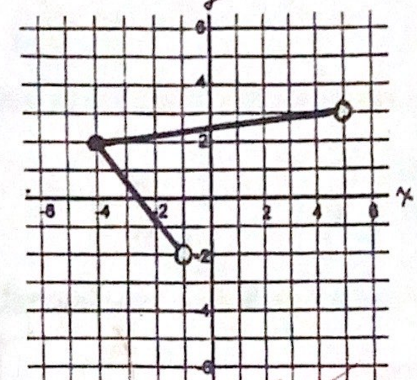
function

D = {1, 3, 5, 6}

R = {2, 4, 7}

3

(3) b)



not a function

D = {x∈ℝ | −4 ≤ x < 5}

R = {y∈ℝ | −2 < y < 3}

3

If there's ± √ it's not a function

(3) c) $f(x) = \sqrt{x+4} - 10$

Function

D = {x∈ℝ | x ≥ −4}

R = {y∈ℝ | y ≥ −10}

3

(3) d) $y = \dfrac{7}{(x+3)(x-6)}$

function

D = {x∈ℝ | x ≠ −3, 6}

R = {y∈ℝ | y ≠ 0}

3

2. For f = { (4,7) , (6,-3) , (10,3), (12,7) } and g = { (6,5) ,(9,11) , (10,5),(11,-6) } find the following.

(1) a) f - g

(6, −8), (10, −2)

2

(1) b) f × g

(6, −15), (10, 15)

$\frac{14}{14}$

2.

(2) 3. Evaluate, show steps. $3|7 - 13| - 5|13 - 9|$

2

$= 3|-6| - 5|4|$

$= 3(6) - 5(4)$

$= 18 - 20$

$= -2$

(1) 4. a) Rewrite the following using **absolute value** symbol:

$\{ x \varepsilon R \mid -7 < x < 7 \}$

$\{x \in \mathbb{R} \mid |x| < 7\}$

b) Rewrite the following using **interval notation**. $\{ -5 < x \leq 4 \}$

(1) $(-5, 4]$

(→ greater than/not = to
[→ less than/= to

5. From the nine parent functions, that we studied in section 1.3 name:
(use equation to name function)

a) one that has two asymptotes and one that has one asymptote

(2) $y = \frac{1}{x}$ ____ $y = 2^x$ ____

(1) b) a function that oscillates $y = \sin x$ ____

c) a function that increases throughout it's entire domain (x ε R) and does **not** have an asymptote and does **not** have a constant slope

(1) $y = x^3$ ____

d) two functions where as x→ - ∞ , y→ ∞ and as x → ∞ , y → ∞

(2) $y = |x|$ ____ $y = x^2$ ____

e) a function with an interval of increase [0 , ∞)

(1) $y = \sqrt{x}$ ____

$\frac{10}{11}$

Part B – Application (30)

1. Use **algebra** to prove the following odd, even or neither.

a) $f(x) = 5x^3 + \frac{2}{x}$

(2)

$f(-x) = 5(-x)^3 + \frac{2}{(-x)}$

(2) 3

$= -5x^3 - \frac{2}{x}$

$= -\left(5x^3 + \frac{2}{x}\right)$

∴, this function ~~is~~ odd
because I got $-f(x)$ when I put in $f(-x)$

b) $f(x) = 7x^2 - 4|x|$

$f(-x) = 7(-x)^2 - 4|-x|$

$= 7x^2 - 4|x|$

you want to make it look the same

∴, this function is even
because I got $f(x)$ when I put in $f(-x)$

2. Fill in the appropriate numbers into the equation $y = \left(\frac{1}{2}\right)^x$ for the following transformations. <u>All transformations in one equation</u>.

(5) 6

i) reflection in the x-axis ii) horizontal stretch by a factor of $\frac{1}{6}$ iii) vertical stretch by a factor of 10 iv) left 3 v) up 8

$y = -10\left(\frac{1}{2}\right)^{-6(x+3))} + 8$

4

3. Find the inverse for $f(x) = -5(x-8)^2 - 7$. Show work.

(3)

$y = -5(x-8)^2 - 7$

$x = -5(y-8)^2 - 7$

3

$y = \pm\sqrt{\frac{x+7}{-5}} + 8$

10/12

4.

4. The point (12 , - 8) is on the graph of $y = f(x)$. Find the corresponding point on the graph of $y = \frac{-1}{4} f(-2x - 14) + 3$. Show work.

(3) 3

$\hookrightarrow -\frac{1}{4} f(-2(x+7)) + 3$

$x = \frac{1}{-2}x - 7 \longrightarrow -\frac{1}{2}(12) - 7 = -13$

$y = -\frac{1}{4}y + 3 \longrightarrow -\frac{1}{4}(-8) + 3 = 5$

∴, the new point is $(-13, 5)$

5. Given the functions $f(x) = -3x^2 - 7x + 10$ and $g(x) = -4x + 5$ find the following

(2) 2

a) $f(g(2))$

$g(2) = -4(2) + 5$
$= -8 + 5$
$= -3$

$f(-3) = -3(-3)^2 - 7(-3) + 10$
$= 4$

(1)

b) $g^{-1}(g(18))$

$g(18) = -4(18) + 5$
$= -67$
$g^{-1}(-67)$

Inverse equation $\rightarrow g^{-1}(x) = \frac{x-5}{-4}$

$= \frac{(-67) - 5}{-4}$ $= 18$

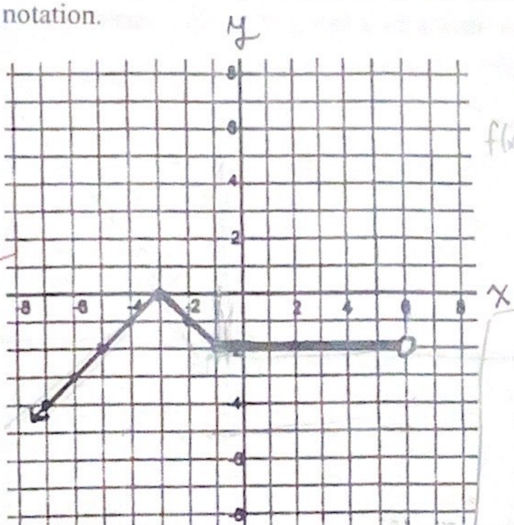
(2) 2

c) $h(x) = f(x) \times g(x)$

$(-3x^2 - 7x + 10)(-4x + 5)$
$= 12x^3 - 15x^2 + 28x^2 - 35x - 40x + 50$
$= 12x^3 + 13x^2 - 75x + 50$

6. Write the algebraic representation for the following piecewise function, using function notation.

(4) 4



$f(x) = \begin{cases} -|x+3|, & \text{if } x \le -1 \\ -2, & \text{if } -1 < x \le 6 \end{cases}$

$-|x|$

can put ≤ on both

7. Factor completely. Show work

(3) 3

a) $30x - 25 + 49y^2 - 9x^2$

$= -9x^2 + 30x - 25 + 49y^2$
$= -9x^2 + 15x + 15x - 25 + 49y^2$
$= -3x(3x - 5) + 5(3x - 5) + 49y^2$
$= (3x - 5)(-3x + 5) + 49y^2$
$= -(3x - 5)^2 + 49y^2$
$= -((3x - 5) - 7y)((3x - 5) + 7y)$
$= -(3x - 5 - 7y)(3x - 5 + 7y)$

(3) 3

b) $70xy - 84x - 35y + 42$

$70xy - 84x - 35y + 42$
$= 14x(5y - 6) - 7(5y - 6)$
$= (14x - 7)(5y - 6)$
$= 7(2x - 1)(5y - 6)$

★ $\frac{16}{18}$

5.

Part C – Communication (12)

5

1. Describe the transformations, in words, that would be needed to get the graph $y = \frac{1}{5}(2^{-3(x-4)}) - 9$, from the parent graph $y = 2^x$. (**one per line**)

- Vertical compression by a factor of $\frac{1}{5}$ (multiply y-values by $\frac{1}{5}$)
- Horizontal compression by a factor of $\frac{1}{3}$ (multiply x-values by $\frac{1}{3}$)
- reflection in x axis (switch signs on x-values)
- Horizontal shift 4 units right (add 4 to x-values)
- Vertical shift 9 units down (subtract 9 from y-values)

4

2

2. Describe the difference in symmetry between an odd function and an even function.

An even function is symmetrical about the y-axis, such as $f(x)=|x|$ or $f(x)=x^2$. An odd function has rotational symmetry by 180°, such as x^3.

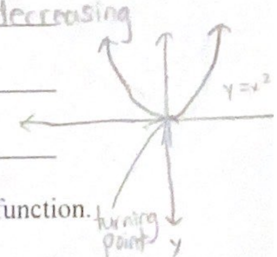
2

1

3. Describe what a turning point is on a curve (graph).

It is a point where a graph changes from increasing to decreasing or decreasing to increasing, such as $f(x)=x^2$

1



4. Discuss the vertical and horizontal continuity/discontinuity for the piecewise function. <u>**Use specific values**</u>.

$f(x) = 5x - 21$ for $0 \le x < 6$ and $f(x) = -4x + 34$ for $6 \le x < 10$

4

$f(6)=5(6)-21$
$=9$

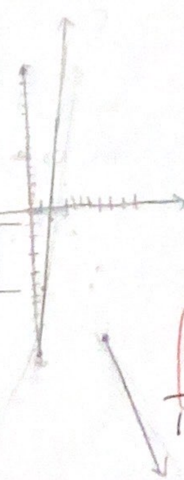
$f(6)=-4(6)+34$
$=10$

3

horizontal → at x=6, the graphs are discontinuous. They are not continuous (I plugged in 6 for the equations and got different answers) even though the x's are all covered from 0 to 9.99

vertical → They are vertically discontinuous as well

there is horizontal continuity b/c all the x's are filled in.



$\frac{10}{12}$

6.

Part D – Thinking & Inquiry (9)

1. Find the inverse of $f(x) = 1 - \sqrt{\frac{x+5}{4}}$.

(4)

$\cancel{x} = -\sqrt{\frac{y+5}{4}} + 1$

$\left(\frac{y-1}{-1}\right)^2 = \left(\sqrt{\frac{x+5}{4}}\right)^2$

2

$4(-y+1)^2 - 5 = x$

$y = 4(x-1)^2 - 5$

$y = 4(-x+1)^2 - 5$

$\therefore\ y = -4(x-1)^2 - 5$, $x \leq 1 \rightarrow$ one branch only

2. The point (3 , 6) is on the graph of y = 2 f (x + 1) – 4 . Find the **original point** on the graph of y = f (x) that was transformed to (3 , 6). **Show work**.

(3)

$x = x - 1$

$y = 2y - 4$

$3 = x - 1$

$6 = 2y - 4$

$x = 4$

$10 = 2y$

$y = 5$

$\therefore$, the original coordinates were $(4, 5)$

To check, sub points back in

$x = 4 - 1$

$y = 2(5) - 4$

$x = 3$

$y = 6$

3

3. State the domain and range for $f(x) = \frac{2}{x^2} - 8$.

(2)

$D = \{x \in \mathbb{R} \mid x \neq 0\}$

$R = \{y \in \mathbb{R} \mid y > -8\}$

1

$\frac{6}{9}$