A∞Ω
MATH@TD

MHF4U Practice for the Chapter 1 Quiz

Lots of ways to solve this one:
- Using Graphing Tech
- $\sqrt{\bigcirc}$ ← "inside" a square root must be "≥ 0"

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. What is the domain of the function $f(x) = \sqrt{3-x}$?

a. $\{x \in \mathbf{R} \mid x \leq 3\}$

b. $\{x \in \mathbf{R} \mid x \geq 3\}$

c. $\{x \in \mathbf{R} \mid x < 3\}$

d. $\{x \in \mathbf{R} \mid 0 < x \leq 3\}$

$\Rightarrow 3 - x \geq 0$

$\Rightarrow 3 \geq x \Rightarrow x \leq 3 \therefore$ ⓐ

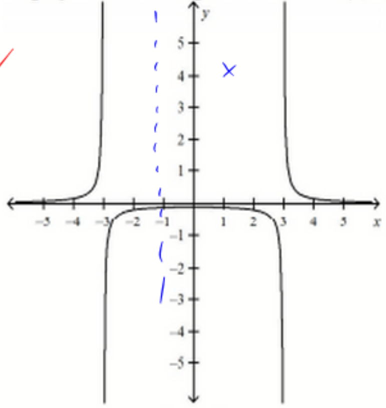
___ 2. Which graph has all four of the following characteristics?

1) The graph is symmetric with respect to the y-axis.

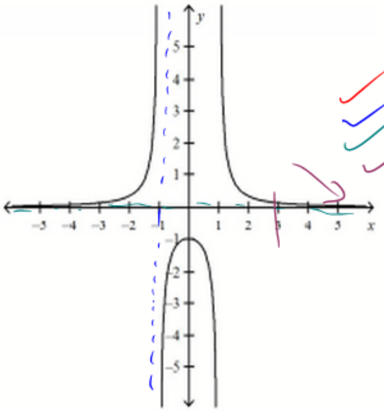
2) The graph has a vertical asymptote at $x = -1$.

3) The graph has a horizontal asymptote at $y = 0$.

4) The graph is decreasing on the interval $(3, \infty)$.

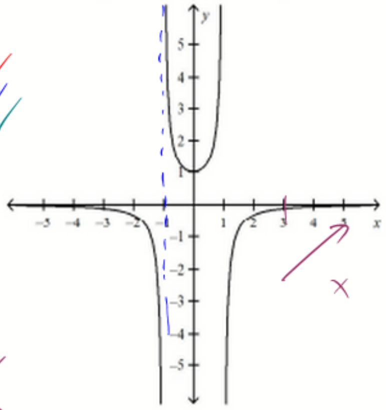


a.

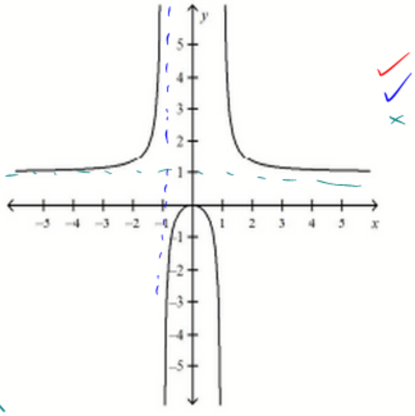


c.

ⓒ



b.



d.

3. Which one of the following functions is odd?

a. $f(x)$ ~~y~~ $= 3 + x$

b. $f(x)$ ~~y~~ $= 3x^2$

c. $f(x)$ ~~y~~ $= 3^x$

d. ~~y~~ $= x^3$ $f(x)$

ⓓ

a) $f(-x) = 3 - x$

$= -(-3 + x)$ ∴ neither

b) $f(-x) = 3(-x)^2$

$= 3x^2 = f(x)$ ∴ even

c) $f(-x) = 3^{-x}$ neither

d) $f(-x) = (-x)^3 = -x^3 = -f(x)$

∴ odd

4. Which function would result from stretching $y = f(x)$ vertically by a factor of 3 and then vertically translating the graph 6 units down?

"$3f(x)$" "$f(x) - 6$"

a. $y = 3f(x) - 6$

b. $y = 3f(x - 6)$

c. $y = f(3x) - 6$

d. $y = f(3x - 6)$

$\Rightarrow 3f(x) - 6$

∴ ⓐ

5. If $f(x) = \frac{x^2}{k} + 1$ and $f^{-1}(5) = 6$, find k.

a. 9

b. 5

c. 6

d. $\frac{6}{4}$

easiest method

∴ $(5, 6)$ is on $f^{-1}(x)$

$(x, f(x))$

∴ $(6, 5)$ is on $f(x)$

↳ plug into $f(x)$

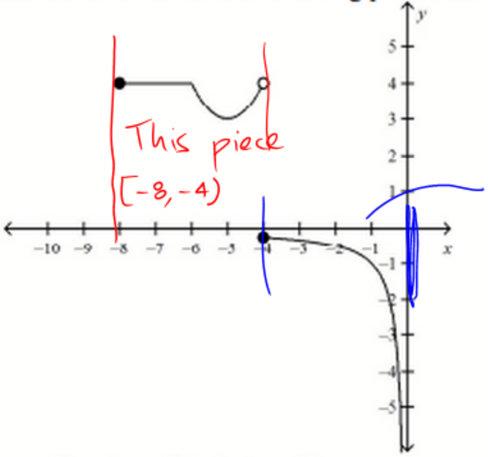
difficult method

find $f^{-1}(x)$ using "brute force" from

$$5 = \frac{(6)^2}{k} + 1$$

$$\Rightarrow 4 = \frac{36}{k} \Rightarrow k = \frac{36}{4} = 9$$ ∴ ⓐ

6. State the domain of the following piecewise function.



This piece

$[-4, 0)$

together

included

included.

$[-8, 0)$

∴ ⓐ

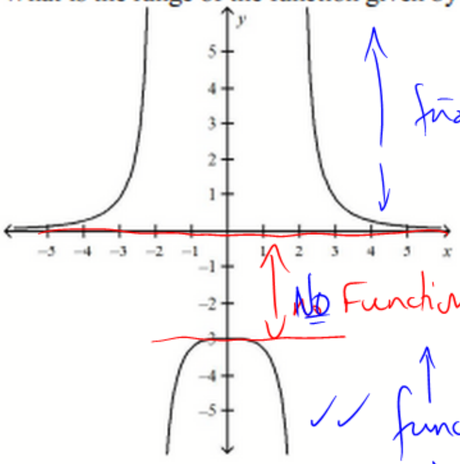
a. $D = \{x \in \mathbf{R} \mid -8 \le x < 0\}$

b. $D = x \in \mathbf{R} \mid -8 < x \le 0\}$

c. $D = \{x \in \mathbf{R} \mid -8 \le x \le 0\}$

d. $D = \{x \in \mathbf{R} \mid -8 < x < 0\}$

7. What is the range of the function given by the following graph?



find values ✓

No Functional values

✓✓ functional values here

f(x) = -3 is hit

$R = (-\infty, -3] \cup (0, \infty)$

"y = 0" is a horizontal asymptote

8. Consider the functions $f(x) = \sqrt{x-1}$ and $g(x) = \dfrac{x-3}{x^2-x-6}$. Which real numbers are in the domains of both $f(x)$ and $g(x)$?

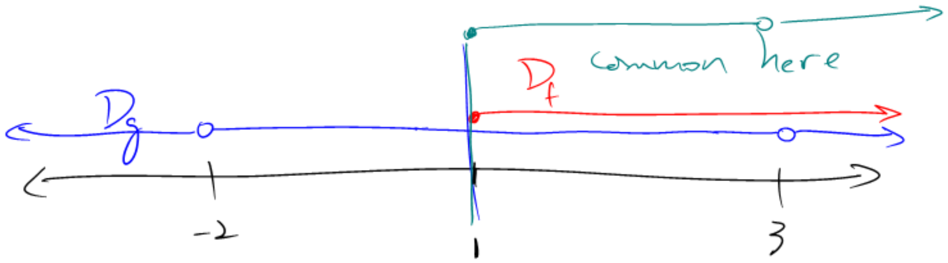
$D_f = [1, \infty)$

$g(x) = \dfrac{x-3}{(x-3)(x+2)}$ ∴ $x = 3$ and $x = -2$ are Not in D_g

in common?

$\Rightarrow D_g = \{x \in \mathbb{R} \mid x \neq 3, x \neq -2\}$

Number line



∴ $D_f \cap D_g = [1, 3) \cup (3, \infty)$ ($x = 3$ is taken out)

"intersection" means "stuff they share"

9. Determine whether the function $f(x) = \dfrac{1+x^2}{|x|}$ is even, odd, or neither.

Consider $f(-x) = \dfrac{1+(-x)^2}{|-x|}$

$= \dfrac{1+x^2}{|x|} = f(x)$ ∴ even.

10. Determine whether the function $f(x) = x^3 + 3x^2 + 1$ is even, odd, or neither.

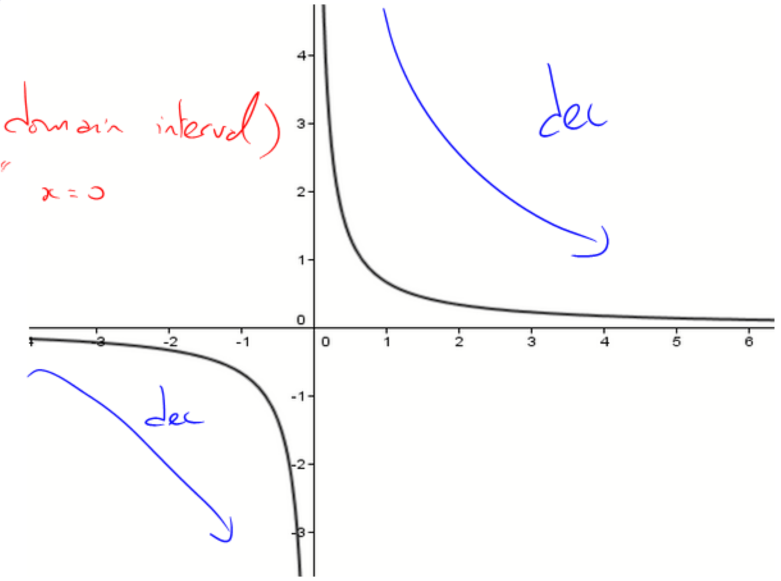
Consider $f(-x) = (-x)^3 + 3(-x)^2 + 1$

$= -x^3 + 3x^2 + 1 \neq f(x)$

$= -(x^3 - 3x^2 - 1) \neq -f(x)$ ∴ neither.

11. Identify the intervals of increase/decrease for the function $f(x) = \dfrac{2}{3x}$.

For this one - use graphing tech



f(x) is decreasing on (the domain interval)

"throws away" $x = 0$

$(-\infty, 0) \cup (0, \infty)$

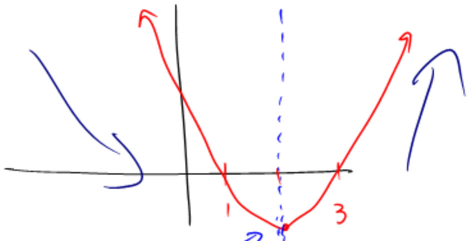
($x = 0$ is not in the domain!)

(or on $x \in \mathbb{R}, x \neq 0$)

12. Identify the intervals of increase/decrease for the function $f(x) = (x - 1)(x - 3)$.

f(x) is a quadratic written in zeros form (with zeros: $x = 1, x = 3$)

f(x) opens up, and so "looks like"



f(x) is decreasing on $(-\infty, 2)$

∴ increasing on $(2, \infty)$

at $x = 2$ we have a TURNING POINT

⟹ increasing/decreasing behavior changes here

axis of symmetry $x = 2$

vertical

13. State the parent function of the equation $y = 1 + 3\sqrt{x+2}$ and the transformations that were applied.

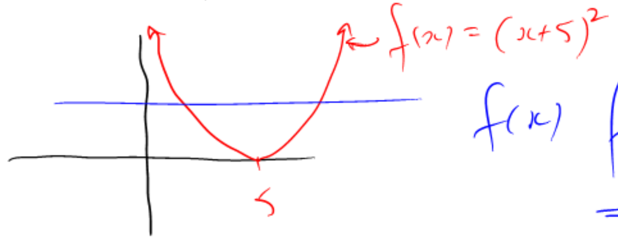
horizontal

Parent fn : $f(x) = \sqrt{x}$

HORIZONTAL	VERTICAL
TRANSLATION LEFT 2	DILATION ×3
	TRANSLATION UP 1

14. Is the inverse of the equation $y = (x+5)^2$ a function?

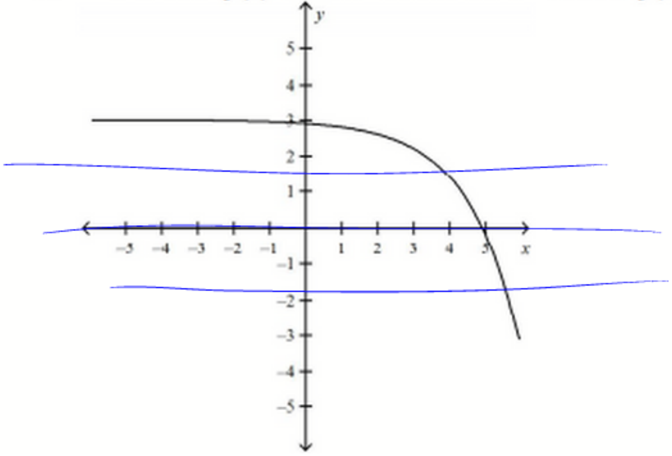
SKETCH OF GRAPH



$f(x)$ fails the Horizontal Line Test

$\Rightarrow f^{-1}(x)$ is NOT a fn

15. The function $f(x)$ is shown below. Is the inverse of $f(x)$ a function?



$f(x)$ passes the H.L.T.

$\therefore f^{-1}(x)$ IS a function

16. If $f(x)$ has a domain of $\{x \in \mathbf{R} \mid x \geq 0\}$ and a range of $\{y \in \mathbf{R} \mid -5 \leq y \leq 5\}$, state the domain and range of the inverse.

$D_{f^{-1}} = R_f = [-5, 5]$

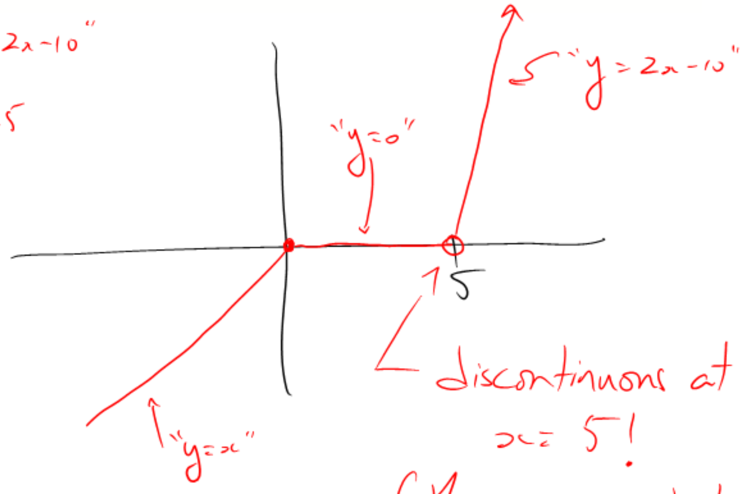
$R_{f^{-1}} = D_f = [0, \infty)$

17. State whether piecewise function $f(x) = \begin{cases} x, \text{ if } x \le 0 \\ 0, \text{ if } 0 < x < 5 \\ 2x - 10, \text{ if } x > 5 \end{cases}$ is continuous. If it is not continuous, state where it is not.

"$y = 2x-10$"

IF $x=5$
$y=0$

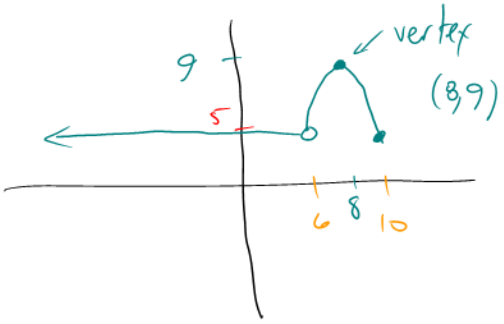
Sketch the graph:



discontinuous at $x=5$!
(there is a hole there)

f(x) is not cts at
$x=5$ (hole discontinuity)

18. ~~Graph~~ Sketch the graph of the following piecewise function: $g(x) = \begin{cases} 5, \text{ if } 0 \le x < 6 \\ 9-(x-8)^2, \text{ if } 6 < x \le 10 \end{cases}$.

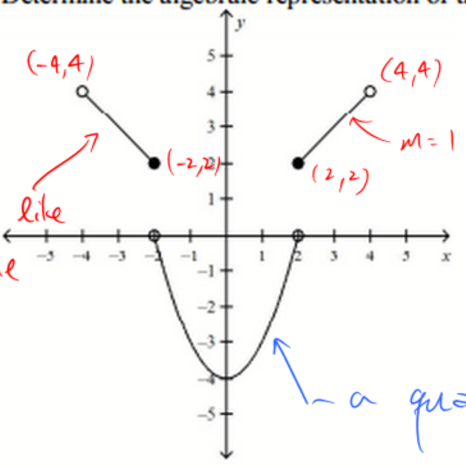


IF $x=6$ here
$g(x)$ would be
$9-(6-8)^2$
$=9-(-2)^2$
$=9-4 = 5$

$g(10) = 9-(10-8)^2$
$= 9-(2)^2$
$= 9-4$
$=5$

19. Determine the algebraic representation of the following piecewise function.

$f(x) = \begin{cases} -x & x \in (-4,-2] \\ x^2-4 & x \in (-2,2) \\ x & x \in [2,4) \end{cases}$



$m=1 \Rightarrow$ eqⁿ $y=x$

looks like
a line

$m = \frac{4-2}{-4-(-2)}$
$= \frac{2}{-2}$
$=-1$

eqⁿ $y=-x$

a quadratic with vertex $(0,-4) \Rightarrow$

need "a"

use a zero
(2,0)

$y = ax^2 - 4$

$0 = a(2)^2 - 4$
$\Rightarrow a = 1$

3 behaviours!