HW6 Solutions:

1. $f(x)=|x|$. Evaluate $f(-2)$ and $f(1)$. Find the domain and range.

- $f(-2) = |-2| = 2$
- $f(1) = |1| = 1$
- $D = (-\infty, \infty) = \{x \in \mathbb{R}\}$
- $R = [0, \infty) = \{x \in \mathbb{R} \mid x \geq 0\}$

2. $f(x) = (x-1)^2$. Evaluate $f(-2)$, $f(1)$, $f(2a)$, and $f(x^3)$. Find the domain and range of f.

- $f(-2) = (-2-1)^2 = 9$
- $f(1) = (1-1)^2 = 0$
- $f(2a) = (2a-1)^2 = 4a^2 - 4a + 1$
- $f(x^3) = (x^3-1)^2 = x^6 - 2x^3 + 1$
- $D = (-\infty, \infty) = \{x \in \mathbb{R}\}$
- $R = [0, \infty) = \{x \in \mathbb{R} \mid x \geq 0\}$

3. $g(x) = \dfrac{x}{|x|}$. Evaluate $g(-2)$, $g(1)$, $g(2a)$, and $g(x^2)$. Find the domain and range of g.

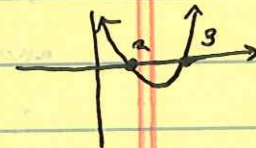
- $g(-2) = \dfrac{-2}{|-2|} = -1$
- $g(1) = \dfrac{1}{|1|} = 1$
- $g(2a) = \dfrac{2a}{|2a|} =$ sign of $2a$
- $g(x^2) = \dfrac{x^2}{|x^2|} = 1$

$D = (-\infty, 0) \cup (0, \infty) = \{x \in \mathbb{R} \mid x \neq 0\}$

$R = \{-1, 1\}$.

4. Find the domain $f(x) = \frac{\sqrt{x^2-5x+6}}{x}$

$x \neq 0$ and $(x^2-5x+6) \geq 0$ $\rightarrow$ graph



$(x-2)(x-3) \geq 0$

$\hookrightarrow$ test: $(0-2)(0-3) \geq 0$ true!

$(4-2)(4-3) \geq 0$ true!

$(2.5-2)(2.5-3) < 0$. No.

so, $x \neq 0$, $x \leq 2$, $x \geq 3$.

Interval notation:

$D = (-\infty, 0) \cup (0, 2) \cup (3, \infty)$

Set notation: $D = \{ x \in \mathbb{R} \mid x \leq 2 \text{ or } x \geq 3 \text{ and } x \neq 0 \}$

3.2.13 (a) The function is increasing from $(-\infty, -4)$ and from $(2, 5)$

(b) The function is decreasing from $(-4, 2)$

(c) The function is never constant

3.2.18

- There is no relative minimum
- " "
- There is only one maximum at $x = 0$.
- ~~There~~ The value at the maximum is 3.

3.2.25 Odd (symmetric about the origin)

3.2.27 $g(-x) = (-x)^5 - (-x)^2 = -x^5 - x^2 \neq -f(x)$

$\neq f(x)$

So it's ~~neither~~ neither.

3.2.29 $F(x) = \dfrac{2x^2-4}{x}$ ← even / ← odd $=$ odd!

3.2.31

a.) $D = (-8, \quad]$

b.) $R = [-5, 3]$

c.) Increasing: $(-8, -6)$, $(-2, 1)$, $(4, 7)$

Decreasing: $(-6, -2)$, $(7, 9)$

Constant: $(1, 4)$

d.) • at $x = -2$, minimum of -5

e.) • at $x = -6$ and $x = 7$

• Values ↳ 3, 2 ↙

f.) $(-15/2, 0)$, $(-4, 0)$, $(5, 0)$, $(9, 0)$

g.) $(0, -3)$

h.) $(-8, -15/2] \cup [-4, 5] \cup [9, 9]$

i.)

j.) $f(2) = 7$