### 4.4 Notes and Examples

**Problem:**
Find and identify all of the intervals where the following function is increasing, decreasing, or constant.

**Click here to see graph.**

**Answer:**
Select the best answer from the options below. Once the choice is made, use the boxes provided to enter each interval, using interval notation.

- Increasing
- Decreasing
- Constant
- Increasing and Decreasing
- Increasing over two intervals
- Decreasing over two intervals

Looking at domain:
Decreasing from $(-\infty, 4)$
Increasing from $(4, \infty)$

**Function:**
Consider the following function.

$$f(x) = [x - 4]$$

**Solution:**
Identify the more basic function that has been shifted, reflected, stretched, or compressed.

Answer: $f(x) = [x]$ use keypad for symbols

Basic functions are the same as parent functions. Ignore any numbers (except for exponents).

**Function:**
Consider the following function.

$$s(x) = [x - 4]$$

**Solution:**
Indicate the shape of the function that was found in step 1.

- [ ] is a step function, so only one graph shows “steps”

Correct: [ ]
You were asked to determine if the following equation has x-axis symmetry, y-axis symmetry, origin symmetry, or none of these.

\[ 2x + y^2 = 2 \]

By definition, an equation in \( x \) and \( y \) is symmetric with respect to:
1. The y-axis if replacing \( x \) with \( -x \) results in an equivalent equation.
2. The x-axis if replacing \( y \) with \( -y \) results in an equivalent equation.
3. The origin if replacing \( x \) with \( -x \) and \( y \) with \( -y \) results in an equivalent equation.

Replacing \( x \) with \( -x \), in this equation, results in the following:
\[ 2(\ -x\ ) + y^2 = 2 \Rightarrow -2x + y^2 = 2 \]

Replacing \( y \) with \( -y \), in this equation, results in the following:
\[ 2x + (-y)^2 = 2 \Rightarrow 2x + y^2 = 2 \]

Replacing \( x \) with \( -x \) and \( y \) with \( -y \), in this equation, results in the following:
\[ 2(\ -x\ ) + (\ -y\ )^2 = 2 \Rightarrow -2x + y^2 = 2 \]

It should be clear, at this point, that replacing \( y \) with \( -y \) results in an equivalent equation. Therefore, this equation has x-axis symmetry.

Correct Answer: x-Axis Symmetry

---

You were asked to determine if the following function is even, odd, or neither.

\[ s(x) = \frac{|x|}{3} - 2 \]

**FUNCTION**

Determine if the following function is even, odd, or neither.

**SOLUTION**

- Even
- Odd
- Neither

Correct Answer: Even

---

Absolute value graphs with positive coefficients open upward

The vertex is at \((-4, 0)\).

The function is decreasing from \((-\infty, -4)\), then increasing from \((-4, \infty)\)
Consider the following function.

\[ f(x) = -\frac{\sqrt{-x}}{2} \]

**Solution**

Identify the more basic function that has been shifted, reflected, stretched, or compressed.

Answer: \( f(x) = \sqrt{x} \)

Consider the following function.

\[ g(x) = (x + 2)^3 \]

**Solution**

Identify the shape of the function that was found in step 1.

We need the graph for \( x^3 \).
Shift a graph 4 units right, not left.

- Stretch or Compress: A stretch occurs when a function is multiplied by a number $|a| > 1$. A compress occurs when functions are divided by a number or multiply by a fraction $< 1$.

  - Stretch $3x^2$ or $-2x^3$
  - Compress $\frac{1}{3}x^2$ or $\frac{x^3}{2}$

- $x$-reflection: the basic function is multiplied by a negative $f(x) = -\frac{x^2}{2}$

- $y$-reflection: the $f(x)$ is multiplied by $-1$. I have never seen one here, but who knows. $f(x) = -x^3$

- Vertical shift: a number added or subtracted to the basic function. No opposite here. $x^2 + 4$ has a vertical shift of 4 units.
Lesson 4.4 - Transformations of Functions
Practice: Question 11 of 20, Step 2 of 2

Consider the following function.
\[ f(x) = \frac{1}{(x+2)^2} + 5 \]

**SOLUTION**

Select the best answer from the options below. Once the choice is made, use the box(es) provided to enter each interval, using interval notation.

- Increasing
- Decreasing
- Constant

○ Increasing and Decreasing
○ Increasing over two intervals
○ Decreasing over two intervals

*Domain of All real numbers \( \mathbb{R} \) from keypad*