Review Exercise Set 2

Exercise 1: Determine the difference quotient of the given function.

\[ f(x) = x^2 - 2x + 1 \]

Exercise 2: Evaluate the given piecewise function at the indicated value.

\[ h(x) = \begin{cases} 3x + 7 & \text{if } x < -1 \\ \sqrt{x + 5} & \text{if } x \geq -1 \end{cases} \quad ; \quad \text{where } x = -3 \]

Exercise 3: Use the given graph to determine the intervals where the function is increasing and decreasing.
Exercise 4: Determine whether the given function is even, odd, or neither.

\[ f(w) = w^6 + w^4 - w^2 \]

Exercise 5: Use the given graph of the function \( g(x) \) to determine each of the following.

- Domain:
- Range:
- x-intercept(s):
- y-intercept:
- Intervals where \( g(x) \) is increasing:
- Intervals where \( g(x) \) is decreasing:
- Intervals where \( g(x) \) is constant:
- Relative Maximum:
- Relative Minimum:
- Is \( g(x) \) even, odd or neither?
Review Exercise Set 2 Answer Key

Exercise 1: Determine the difference quotient of the given function.

\[ f(x) = x^2 - 2x + 1 \]

Find \( f(x + h) \)

\[ f(x + h) = (x + h)^2 - 2(x + h) + 1 \]
\[ f(x + h) = x^2 + 2hx + h^2 - 2x - 2h + 1 \]

Find \( f(x + h) - f(x) \)

\[ f(x + h) - f(x) = (x + h)^2 + 2hx + h^2 - 2x - 2h + 1 - (x^2 - 2x + 1) \]
\[ f(x + h) - f(x) = x^2 + 2hx + h^2 - 2x - 2h + 1 - x^2 + 2x - 1 \]
\[ f(x + h) - f(x) = 2hx + h^2 - 2h \]

Find \( \frac{f(x + h) - f(x)}{h} \)

\[ \frac{f(x + h) - f(x)}{h} = \frac{2hx + h^2 - 2h}{h} \]
\[ = \frac{h(2x + h - 2)}{h} \]
\[ = 2x + h - 2 \]

Exercise 2: Evaluate the given piecewise function at the indicated value.

\[ h(x) = \begin{cases} 
3x + 7 & \text{if } x < -1 \\
\sqrt{x + 5} & \text{if } x \geq -1
\end{cases} \quad \text{where } x = -3 \]

Since \(-3 < -1\), we would use the top function of \( h(x) = 3x + 7 \)

\[ h(x) = 3x + 7 \]
\[ h(-3) = 3(-3) + 7 \]
\[ h(-3) = -9 + 7 \]
\[ h(-3) = -2 \]
Exercise 3: Use the given graph to determine the intervals where the function is increasing and decreasing.

Increasing intervals: \((-\infty, -2) \cup (1, \infty)\)

Decreasing interval: \((-2, 1)\)

Exercise 4: Determine whether the given function is even, odd, or neither.

\[ f(w) = w^6 + w^4 - w^2 \]

Find \(f(-w)\) and compare with \(f(w)\)

\[ f(-w) = (-w)^6 + (-w)^4 - (-w)^2 \]
\[ f(-w) = w^6 + w^4 - w^2 \]

\(f(-w) = f(w)\), so the function is even
Exercise 5: Use the given graph of the function $g(x)$ to determine each of the following.

- **Domain:** $(-\infty, \infty)$
- **Range:** $[-4, \infty)$
- **$x$-intercept(s):** $(-4, 0)$ and $(4, 0)$
- **$y$-intercept:** $(0, -1.5)$
- **Intervals where $g(x)$ is increasing:** $(-2.5, -0.5) \cup (2.5, \infty)$
- **Intervals where $g(x)$ is decreasing:** $(-\infty, -2.5) \cup (-0.5, 2.5)$
- **Intervals where $g(x)$ is constant:** None
- **Relative Maximum:** None
- **Relative Minimum:** $(-2.5, -2)$ and $(2.5, -4)$
- **Is $g(x)$ even, odd or neither?** Neither