

1 Section 2.2

Exercise 1 Consider the following function $f(x) = 2 - |x|$ and find the following:

1) x-intercepts (if any) 2) y-intercept (if any) 3) use 1 and 2 to sketch the graph of $f(x)$ 4) find the domain and the range of the function f .

Exercise 2 Given the function $f(x) = -|x + 4| + 3$ and find the following: 1) Sketch the graph of $f(x)$ 2) use the graph of $f(x)$ to find the following:

1) the x-intercept(s). 2) the y-intercept. 3) the domain of $f(x)$. 4) the range of $f(x)$. 5) the axis of symmetry.

Exercise 3 Given the function $f(x) = \begin{cases} 3, & \text{if } x \leq -2 \\ x^2, & \text{if } -2 < x \leq 3 \\ -x + 2, & \text{if } 3 < x \leq 7 \end{cases}$ and find the following

1) Sketch the graph of $f(x)$ 2) Use the graph of $f(x)$ to find 1) the x-intercepts 2) the y-intercepts
3) The intervals where $f(x)$ is 1) Increasing 2) Decreasing 3) Constant

Exercise 4 Let $g(x) = [x]$, where $[x]$ is the greatest integer function. Find the value of $\frac{g(x-a)+g(a-x)}{g(\frac{x}{a})}$ where $x = 1.5$ and $a = 0.06$.

Exercise 5 If one of the x-intercepts of the graph of the function $f(x) = 3x^2 + kx - 4$ is 4, then find the second x-intercept.

Exercise 6 Let $f(x) = \begin{cases} x^2 - 2, & \text{if } x < 1 \\ x + 2, & \text{if } x \geq 1 \end{cases}$. If $-10 < k < -5$, then find $f(-k) + f(k)$.

Exercise 7 Find the x-intercepts of $f(x) = [-3x + \frac{3}{2}]$, where $[x]$ denotes the greatest integer function.

Exercise 8 Answer the following questions about the graph of the function given in Figure A.

1) Find the x-intercepts 2) Find the intervals where the function is increasing 3) Find the intervals where the function is decreasing 4) Find the intervals where the function is constant 5) Evaluate $f(-2) - f(3) + f(7)$

Exercise 9 If $f(x) = \frac{1}{x+1}$, then find the value of $\frac{f(1+h)-f(1)}{h}$. (ans: $\frac{-1}{2(2+h)}$)

Exercise 10 If $f(x) = x^2$, then find the value of $\frac{f(x+h)-f(x)}{2xh+h^2}$. (ans: 1)

Exercise 11 If $f(x) = 3-x^2$, then find the value of $[f(x)]^2+f(x^2-1)$. (ans: $11-4x^2$)

Exercise 12 If $f(x) = \sqrt{x^2+2x+1}$ with $-2 < x < -1$, then find the value of $\frac{f(x-2)}{x-1}$. (ans: -1)

Exercise 13 How many x - and y -intercepts have the graph of $f(x) = \begin{cases} |x| - 1, & \text{if } x > -1 \\ x - 1, & \text{if } x \leq -1 \end{cases}$ (ans: one x -intercept and one y -intercept)

Exercise 14 If $f(x) = [2x - 1]$, where $[\]$ is the greatest integer function, then find the value of x where $f(x) = 0$. (ans: $\frac{1}{2} \leq x < 1$)

Exercise 15 If $f(x) = [1 - 2x]$, where $[\]$ is the greatest integer function, then find the value of x where $f(x) = 1$. (ans: $-\frac{1}{2} < x \leq 0$)

Exercise 16 If $f(x) = [3x - 2]$, where $[\]$ is the greatest integer function, then find the x - and y -intercepts. (ans: $\frac{2}{3} \leq x < 1$ and $y = -2$)

Exercise 17 If $f(x) = [x] + 1$, where $[\]$ is the greatest integer function, then which part of the graph lies on the x -axis. (ans: $[-1, 0)$)

Exercise 18 Given $f(x) = \begin{cases} 2x + 1, & \text{if } x < 2 \\ [2x + 1], & \text{if } x \geq 2 \end{cases}$, where $[\]$ is the greatest integer function, then find the value of $f(-4) + f(\frac{7}{3})$. (ans: -2)

Exercise 19 Given $f(x) = \begin{cases} \sqrt{(1-5x)^2}, & \text{if } x < 2 \\ [2x + 1], & \text{if } x \geq 2 \end{cases}$, where $[\]$ is the greatest integer function, then find the value of $f(\pi) + f(1)$. (ans: 11)

Exercise 20 Let $f(x) = [x]$, where $[x]$ is the greatest integer function. Find the value of $\frac{f(x+h)+f(x)}{h}$ where $x = 1.5$ and $h = 0.5$. (ans: 2)

Exercise 21 Let $f(x) = [x]$, where $[x]$ is the greatest integer function. Then only one of the following statements is TRUE?

- a) $y = [x]$ is not a function by the vertical line test. b) $[\pi - 1] = 3$. c) $[x] = -3$, if $-4 \leq x < -3$. d) The range of $y = [x]$ is the set of all integers. e) The domain of $y = [x]$ is the set of all integers. (ans: d)

Exercise 22 Find the Domain of the following Functions:

- 1) $f(x) = \sqrt{x^2 - 3x - 4}$ (ans: $(-\infty, -1] \cup [4, \infty)$) 2) $f(x) = -\sqrt{\frac{7}{5-|x|}}$ (ans: $(-5, 5)$) 3) $f(x) = \sqrt{-x^2 - 25}$ (ans: ϕ)
4) $f(x) = \sqrt{\frac{-3+4x-x^2}{x}}$ (ans: $(-\infty, 0) \cup [1, 3]$) 5) $f(x) = \sqrt[3]{25-x^2}$ (ans: $(-\infty, \infty)$) 6) $f(x) = \sqrt{x^2 - 4}$

Exercise 23 23- Find the Range of the following functions:

1) $y = \sqrt{9 - x^2}$ (ans: $[0, 3]$) 2) $y + 1 = -\sqrt{x + 2} + 4$ (ans: $(-\infty, 3]$)
3) $g(x) = \sqrt{\frac{1}{x^2 + 9}}$ (ans: $[\frac{-1}{3}, 0)$)

Exercise 24 24- Find the Domain D and the Range R of the following functions:

1) $f(x) = \frac{-3}{4x^2 + 4x + 1}$ (ans: $D = (-\infty, \frac{-1}{2}) \cup (\frac{1}{2}, \infty)$ and $R = (-\infty, 0)$) 2) $f(x) = \sqrt{-3x - 12}$ (ans: $D = (-\infty, -4]$ and $R = [0, \infty)$)
3) $f(x) = \sqrt{|x - 5|}$ (ans: $D = (-\infty, \infty)$ and $R = [0, \infty)$) 4) $|xy| = 1$.
(ans: $D = R = (-\infty, 0) \cup (0, \infty)$)
5) $|x + y| = 1$ (ans: $D = R = (-\infty, \infty)$) 6) $f(x) = \frac{\sqrt{4 - 9x^2}}{2}$ 7) $y = |x + 2| - 1$