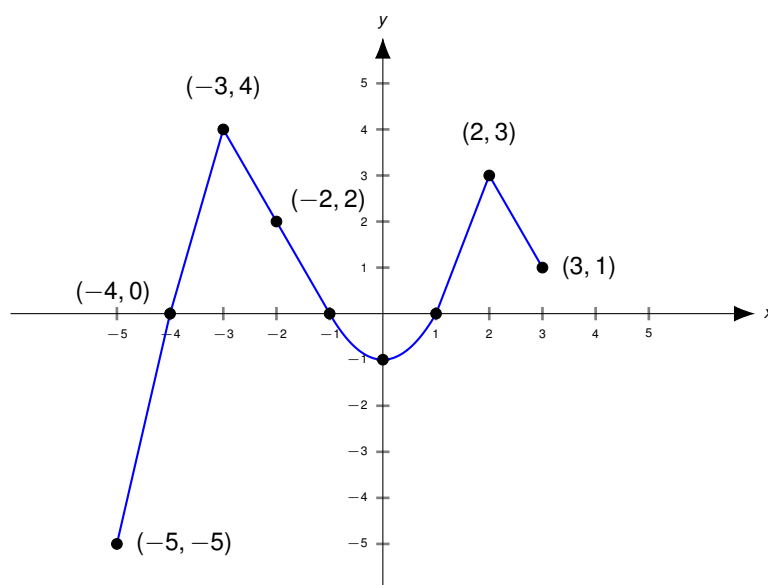


EXERCISES FOR GRAPHS OF FUNCTIONS

Question 1 In Exercises ?? - ??, use the graph of $y = f(x)$ given below to answer the question.



The graph of $y = f(x)$.

Problem 1.1 Find the domain of f . $[-5, 3]$

Problem 1.2 Find the range of f . $[-5, 4]$

Problem 1.3 Find the maximum, if it exists. $f(-3) = 4$

Problem 1.4 Find the minimum, if it exists. $f(-5) = -5$

Problem 1.5 List the local maximums, if any exist. $(-3, 4), (2, 3)$

Problem 1.6 List the local minimums, if any exist. $(0, -1)$

Problem 1.7 List the intervals where f is increasing. $[-5, -3], [0, 2]$

Problem 1.8 List the intervals where f is decreasing. $[-3, 0], [2, 3]$

Problem 1.9 Determine $f(-2)$. $f(-2) = 2$

Problem 1.10 Solve $f(x) = 4$. $x = -3$

Problem 1.11 List the x -intercepts, if any exist. $(-4, 0), (-1, 0), (1, 0)$

Problem 1.12 List the y -intercepts, if any exist. $(0, -1)$

Problem 1.13 Find the zeros of f . $-4, -1, 1$

Problem 1.14 Solve $f(x) \geq 0$. $[-4, -1], [1, 3]$

Problem 1.15 Find the number of solutions to $f(x) = 1$. 4

EXERCISES FOR GRAPHS OF FUNCTIONS

Problem 1.16 Find the number of solutions to $|f(x)| = 1$. 6

Problem 1.17 Solve $(x^2 - x - 2)f(x) = 0$ $x = -4, -1, 1, 2$

Problem 1.18 Solve $(x^2 - x - 2)f(x) > 0$

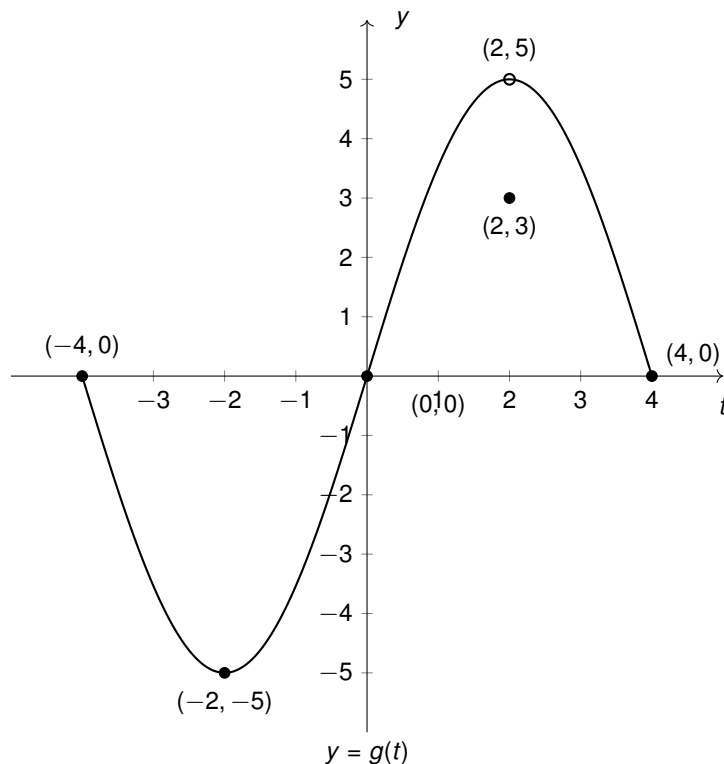
$(-4, -1) \cup (-1, 1) \cup (2, 3)$

Problem 1.19 Find the domain of $R(x) = \frac{1}{f(x)}$ To find the domain of $R(x) = \frac{1}{f(x)}$, we start with the domain of f and exclude values where $f(x) = 0$. Hence, the domain of R is $[-5, -4) \cup (-4, -1) \cup (-1, 1) \cup (1, 3]$.

Problem 1.20 Find the range of $R(x) = \frac{1}{f(x)}$

To find the range of $R(x) = \frac{1}{f(x)}$, we start with the range of f (excluding 0) and take reciprocals. If $-5 \leq y < 0$, then $\frac{1}{y} \leq -\frac{1}{5}$. If $0 < y \leq 4$, then $\frac{1}{y} \geq \frac{1}{4}$. Hence the range of R is $(-\infty, -\frac{1}{5}] \cup [\frac{1}{4}, \infty)$.

Question 2 In Exercises ?? - ??, use the graph of $y = g(t)$ given below to answer the question.



Problem 2.1 Find the domain of g . $[-4, 4]$

Problem 2.2 Find the range of g .

$[-5, 5]$

Problem 2.3 Find the maximum, if it exists. none

EXERCISES FOR GRAPHS OF FUNCTIONS

Problem 2.4 Find the minimum, if it exists.

$$g(-2) = -5$$

Problem 2.5 List the local maximums, if any exist. none

Problem 2.6 List the local minimums, if any exist.

$$(-2, -5), (2, 3)$$

Problem 2.7 List the intervals where g is increasing. $[-2, 2)$

Problem 2.8 List the intervals where g is decreasing.

$$[-4, -2], (2, 4]$$

Problem 2.9 Determine $g(2)$. $g(2) = 3$

Problem 2.10 Solve $g(t) = -5$.

$$t = -2$$

Problem 2.11 List the t -intercepts, if any exist. $(-4, 0), (0, 0), (4, 0)$

Problem 2.12 List the y -intercepts, if any exist.

$$(0, 0)$$

Problem 2.13 Find the zeros of g . $-4, 0, 4$

Problem 2.14 Solve $g(t) \leq 0$.

$$[-4, 0] \cup \{4\}$$

Problem 2.15 Find the domain of $G(t) = \frac{g(t)}{t+2}$. $[-4, -2) \cup (-2, 4]$

Problem 2.16 Solve $\frac{g(t)}{t+2} \leq 0$.

$$\{-4\} \cup (-2, 0] \cup \{4\}$$

Problem 2.17 How many solutions are there to $[g(t)]^2 = 9$? 5

Problem 2.18 Does g appear to be even, odd, or neither?

Neither.

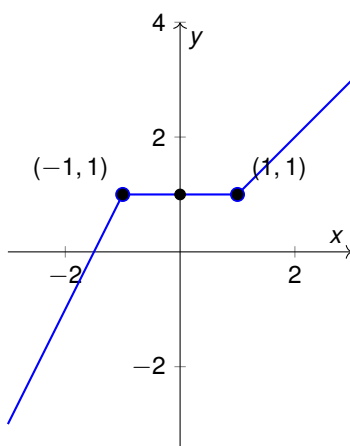
Problem 3 Prove that if f is an odd function and 0 is in the domain of f , then $f(0) = 0$.

Problem 4 Let $R(x)$ be the function defined as: $R(x) = 1$ if x is a rational number, $R(x) = 0$ if x is an irrational number. With help from your classmates, try to graph R . What difficulties do you encounter?

NOTE: Between every pair of real numbers, there is both a rational and an irrational number...

Problem 5 Consider the graph of the function f given below.

EXERCISES FOR GRAPHS OF FUNCTIONS



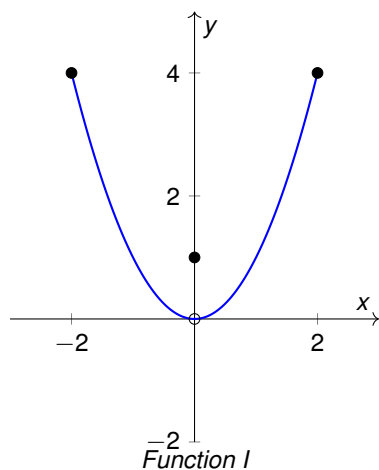
Problem 6 Explain why f has a local maximum but not a local minimum at the point $(-1, 1)$.

Problem 7 Explain why f has a local minimum but not a local maximum at the point $(1, 1)$.

Problem 8 Explain why f has a local maximum AND a local minimum at the point $(0, 1)$.

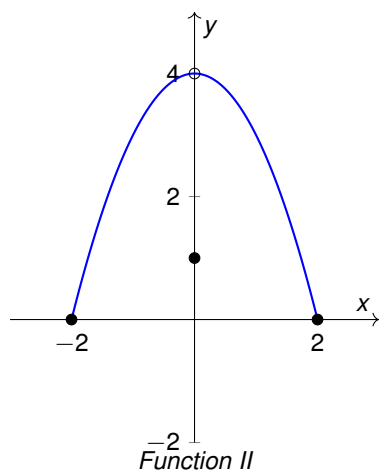
Problem 9 Explain why f is constant on the interval $[-1, 1]$ and thus has both a local maximum AND a local minimum at every point $(x, f(x))$ where $-1 < x < 1$.

Problem 10 For each function below, find the local maximum or local minimum and list the interval over which the function is increasing and the interval over which the function is decreasing.

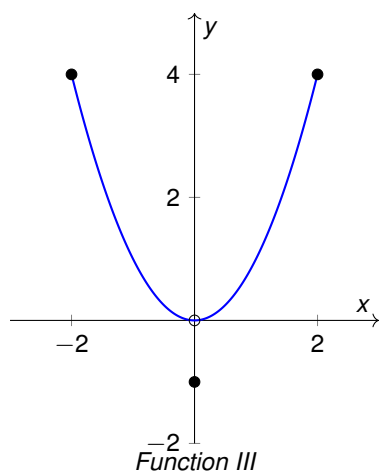


Local maximum: $(0, 1)$, no local minimum. Increasing: $(0, 2]$, decreasing: $[-2, 0)$.

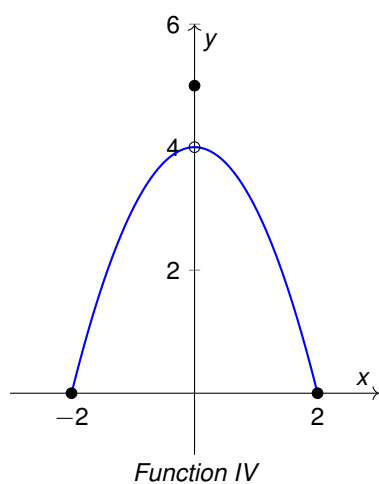
EXERCISES FOR GRAPHS OF FUNCTIONS



No local maximum, local minimum: $(0, 1)$. Increasing: $[-2, 0)$, decreasing: $(0, 2]$.



No local maximum, local minimum: $(0, -1)$. Increasing: $[0, 2]$, decreasing: $[-2, 0]$.



Local maximum: $(0, 5)$, no local minimum. Increasing: $[-2, 0]$, decreasing: $[0, 2]$.