

Real Functions: Group Exercises

CSCI 246

March 9, 2026

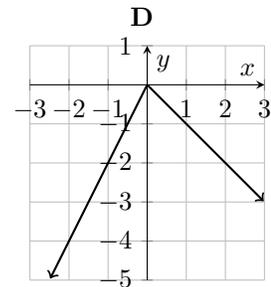
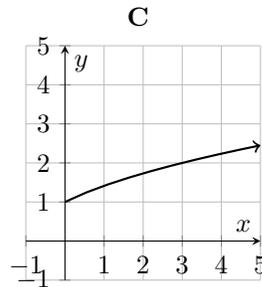
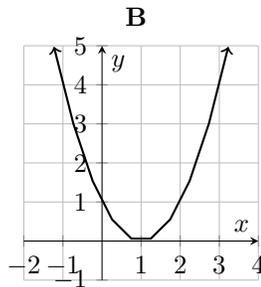
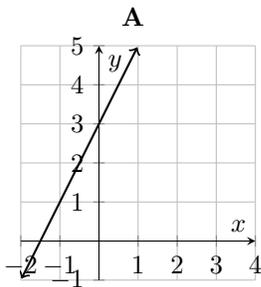
Problem 1. Label each graph with the matching function from:

A $f : \mathbb{R} \rightarrow \mathbb{R}$ with $f(x) = 2x + 3$

C $f : [0, \infty) \rightarrow \mathbb{R}$ with $f(x) = \sqrt{x+1}$

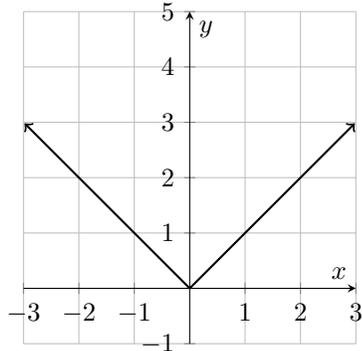
B $f : \mathbb{R} \rightarrow \mathbb{R}$ with $f(x) = x^2 - 2x + 1$

D $f : \mathbb{Z} \rightarrow \mathbb{Z}$ with $f(x) = \begin{cases} 2x & \text{if } x > 0 \\ -x & \text{otherwise} \end{cases}$

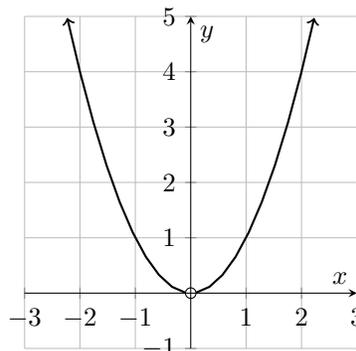


Problem 2. Plot the following functions:

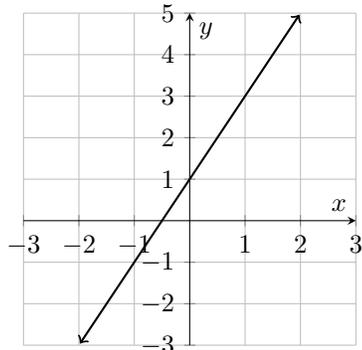
A. $f : \mathbb{R} \rightarrow \mathbb{R}$ with $f(x) = |x|$



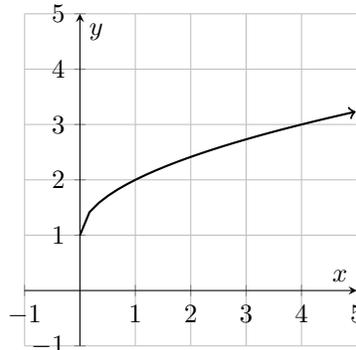
B. $f : \mathbb{R} \rightarrow \mathbb{R}$ with $f(x) = \frac{x^3}{x}$



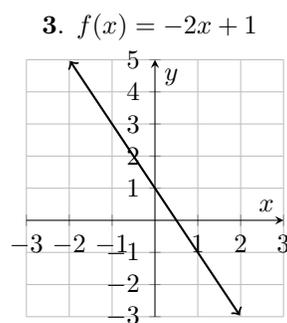
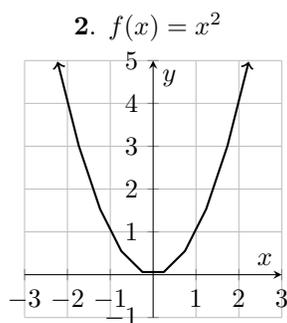
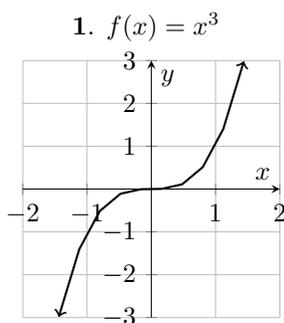
C. $f : \mathbb{Z} \rightarrow \mathbb{Z}$ with $f(x) = 2x + 1$



D. $f : \mathbb{R} \rightarrow \mathbb{R}$ with $f(x) = 1 + \sqrt{x}$



Problem 3. Consider the following real-valued functions:



A. Which functions are increasing for all real numbers? **1.**

B. Which functions are decreasing for all real numbers? **3.**

C. Which functions are neither decreasing nor increasing for all real numbers?

If applicable, on which domains is the function increasing/decreasing?

Function **2.** Decreasing on $(-\infty, 0]$ and increasing on $[0, \infty)$.

Problem 4. Recall the functions in **Problem 3:** i.e., $f_1(x) = x^3$, $f_2(x) = x^2$, and $f_3(x) = -2x + 1$.

A. Order the functions from slowest to fastest order of growth as $x \rightarrow \infty$.

f_3 grows slowest, f_2 grows faster than f_3 but slower than f_1 , and f_1 grows fastest as $x \rightarrow \infty$.

B. Compute the values of each function for $x = 1, 2, 5, 10$.

$f_1(1) = 1$	$f_1(2) = 8$	$f_1(5) = 125$	$f_1(10) = 1000$
$f_2(1) = 1$	$f_2(2) = 4$	$f_2(5) = 25$	$f_2(10) = 100$
$f_3(1) = -1$	$f_3(2) = -3$	$f_3(6) = -9$	$f_3(10) = -19$

C. Which function eventually becomes the largest?

Function f_3 is eventually the largest since it is positive and grows the fastest.