

Handout 8: 2.4 Domain and Range

1. A student was asked to find the domain of the following functions, but in each case made a mistake in their work and/or answer. Find the student's mistake, and show the correct work and answer.

$$f(x) = \frac{1}{x+3}$$

$$g(x) = \sqrt{x^2 - 4}$$

$$h(x) = \sqrt{5x - 6}$$

a. Student's Work and Answer

$$\begin{aligned} x + 3 &\geq 0 \\ x &\geq -3 \\ \{x|x &\geq -3\} \end{aligned}$$

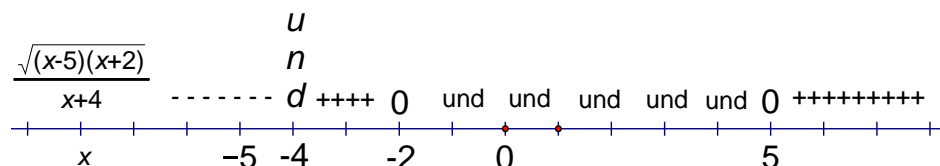
b. Student's Work and Answer

$$\begin{aligned} x^2 - 4 &\geq 0 \\ x^2 &\geq 0 \\ x &\geq \pm\sqrt{4} \\ \{x|x &\geq \pm 2\} \end{aligned}$$

c. Student's Work and Answer

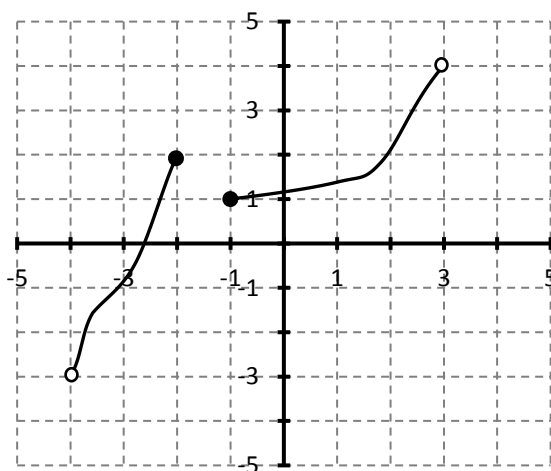
$$\begin{aligned} \sqrt{5x - 6} &\geq 0 \\ (\sqrt{5x - 6})^2 &\geq (0)^2 \\ 5x - 6 &\geq 0 \\ 5x &\geq 6 \\ \{x|x &\geq \frac{6}{5}\} \end{aligned}$$

2. A student was asked to find the domain of $(x) = \frac{\sqrt{(x-5)(x+2)}}{x+4}$, and they made the following sign chart.



Write a few sentences that explain why the student's approach was not an efficient way of answering the question. Then, show the correct work that leads to a correct solution.

3. State the domain and range for the function graphed below.



4. Determine which of the following values are in the **range** of the function $h(t) = \frac{3t^2+5}{t-6}$.

- a. 0 b. 1 c. -1 d. 70

5. For each of the following functions, decide whether or not a sign chart is necessary when finding the domain and state a reason for each.

a. $f(x) = \sqrt{\frac{2x-5}{5-x}}$ b. $g(x) = \frac{3x+7}{x}$ c. $h(x) = \frac{\sqrt{x+1}}{x^2-9}$

6. Find the domain for the following functions.

a. $f(x) = \sqrt{x^2 + 5x + 6}$ b. $h(x) = \frac{1}{x^2+5x+6}$ c. $h(x) = \frac{1}{\sqrt{x^2+5x+6}}$ d. $j(x) = \sqrt{x+2}\sqrt{x+3}$

7. State the domain for each function below.

a. $y = \sqrt{3 - \frac{1}{2x}}$ b. $p(n) = \frac{4}{3n^2-n-2}$ c. $g(w) = \frac{1}{\sqrt{15-w}}$

d. $\omega = |\sin(\theta)|$ e. $y = \frac{3x^2+5x}{x+12}$

8. Is $f(x) = \frac{3x^2-8x-3}{x-3}$ equivalent to $g(x) = 3x + 1$? Why or why not?

9. Is $f(x) = \frac{(3x+1)(x-2)}{x-2}$ for $x \neq 2$ and 6 equivalent to $g(x) = \frac{(3x+1)(x-6)}{x-6}$ for $x \neq 2$ and 6?

10. Is $p(t) = \frac{\sqrt{t-1}}{t-4}$ equivalent to $(t) = \sqrt{\frac{t-1}{(t-4)^2}}$? Why or why not?

11. Which of the following functions is NOT equivalent to the other two? Why? You must show work that supports your answer.

a. $a(x) = \sqrt{(x-1)^2}$ b. $b(x) = |x-1|$ c. $c(x) = \frac{(|x-1|)^2}{|x-1|}$

12. The growth of a red oak tree is approximated by the function

$G(t) = -0.003t^3 + 0.137t^2 + 0.458t - 0.839$, where G is the height of the tree in feet and t is its age in years.

a. Interpret what $G(10)$ represents with regard to this application. (*State in words*)

b. How long will it take a red oak to reach a height of 50 feet? *Use your calculator here.*

c. By looking at the graph of this function on your calculator decide what would be an appropriate domain and range for this function. Explain your reasoning.

13. The total sales of sporting goods in the United States from 1981 through 1992 can be approximated by the model $S(t) = 16.8091 + 0.715t^2 - 0.0446t^3$, where the sales are measured in billions of dollars and the time t represents the calendar year, with $t = 1$ corresponding to 1981.
- State the appropriate domain and range for $S(t)$. Explain your reasoning.
 - Find $S(9)$.
 - Interpret $S(9)$.
 - Solve $S(t) = 32.91$.
 - Interpret $S(t) = 32.91$.
 - This model only gave approximate values, the actual sales for 1990 was 44.1 billion. How much error did this model have for the year 1990?
14. Suppose $S(g)$ is a function that predicts a person's starting annual salary for their first job after college, based on their college GPA. What is a reasonable domain for this function?