

CYCLE # 4 Domain, Range, and Symmetry

Show all work. No Calculator

1. Find the x - and y -intercepts and domain, then sketch the graph and find the range.

(a) $f(x) = \sqrt{2-x}$

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

(c) $f(t) = \frac{|t-3|}{t-3}$

(d) $h(m) = \begin{cases} (m-1)^2, & m \geq 1 \\ 3m-3, & m < 1 \end{cases}$

2. Sketch the following piecewise functions, then find the domain and range of each.

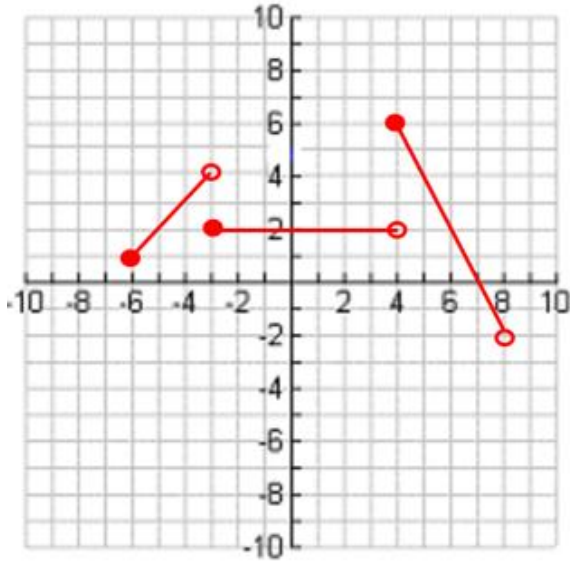
(a) $f(x) = \begin{cases} 3-x, & x \leq 1 \\ 2x, & 1 < x \end{cases}$

(b) $g(x) = \begin{cases} 2, & x < 0 \\ \sqrt{x}, & x \geq 0 \end{cases}$

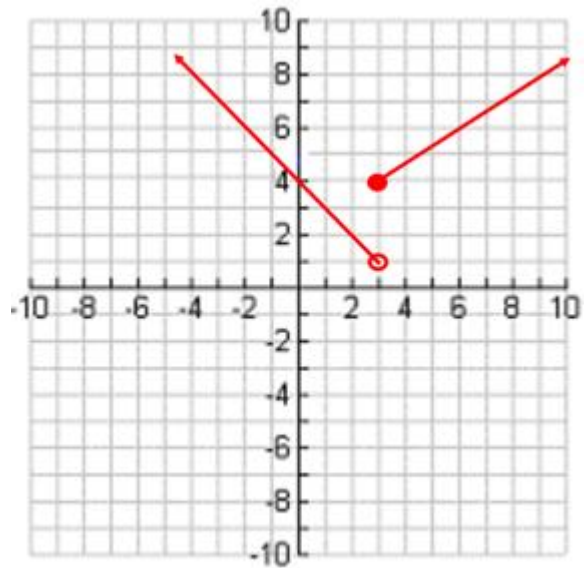
(c) $h(t) = \begin{cases} t^2, & t < 0 \\ t^3, & 0 \leq t \leq 1 \\ 2t-1, & t > 1 \end{cases}$

3. Write a piecewise function for the given graphs

(a)



(b)



Multiple Choice

_____ 4. Which of the following defines a function f for which $f(-x) = -f(x)$?

- (A) $f(x) = x^2$ (B) $f(x) = \sin x$ (C) $f(x) = \cos x$ (D) $f(x) = \log x$ (E) $f(x) = e^x$

_____ 5. Which of the following equations has a graph that is symmetric with respect to the origin?

- (A) $y = \frac{x+1}{x}$ (B) $y = -x^5 + 3x$ (C) $y = x^4 - 2x^2 + 6$ (D) $y = (x-1)^3 + 1$ (E) $y = (x^2 + 1)^2 - 1$

_____ 4. If $F(x) = x^{-2/3}(x-2)^{2/3} + x^{1/3}(x-2)^{-1/3}$, find the domain of F .

- (A) $D_F : \{x | x \neq 0\}$ (B) $D_F : \{x | x > 0\}$ (C) $D_F : \{x | 0 \leq x \leq 2\}$
(D) $D_F : \{x | x \neq 0 \text{ and } x \neq 2\}$ (E) $D_F : \{x | x \text{ is a real number}\}$

_____ 5. The domain of the function defined by $g(x) = \ln(x^2 - 4)$ is the set of all real numbers x such that

- (A) $|x| < 2$ (B) $|x| \leq 2$ (C) $|x| > 2$ (D) $|x| \geq 2$ (E) x is a real number

_____ 6. The graph of $y^2 = x^2 + 9$ is symmetric to which of the following?

- I. The x -axis
II. The y -axis
III. The origin
(A) I only (B) II only (C) III only (D) I and II only (E) I, II, and III

_____ 7. What is the domain of the function f given by $f(x) = \frac{\sqrt{x^2 - 4}}{x - 3}$?

- (A) $\{x : x \neq 3\}$ (B) $\{x : |x| \leq 2\}$ (C) $\{x : |x| \geq 2\}$
(D) $\{x : |x| \geq 2 \text{ and } x \neq 3\}$ (E) $\{x : x \geq 2 \text{ and } x \neq 3\}$

- _____ 8. Let f and g be odd functions. If p , r , and s are nonzero functions defined as follows, which must be odd?
- I. $p(x) = f(g(x))$
 - II. $r(x) = f(x) + g(x)$
 - III. $s(x) = f(x)g(x)$
- (A) I only (B) II only (C) I and II only (D) II and III only (E) I, II, and III

- _____ 9. If the function f is continuous for all real numbers and if $f(x) = \frac{x^2 - 4}{x + 2}$ when $x \neq -2$, then $f(-2) =$
- (A) -4 (B) -2 (C) -1 (D) 0 (E) 2

- _____ 10. Let f be the function defined by $f(x) = \begin{cases} x^3 & \text{for } x \leq 0, \\ x & \text{for } x > 0. \end{cases}$ Which of the following statements about f is true?
- (A) f is an odd function (B) There is a break in the graph of f at $x = 0$ (C) f has no x -intercepts
(D) f is monotonic increasing (E) $f(|x|) = |x|$

_____ 11. Find the domain of the function $f(x) = \frac{\sqrt{x+1}}{x-5}$.

- (A) $D_f : \{x|x \geq 1\}$ (B) $D_f : \{x|x < 1, x \neq -5\}$ (C) $D_f : \{x|x \leq -1, x \neq -5\}$
 (D) $D_f : \{x|x > -1, x \neq -5\}$ (E) $D_f : \{x|x \leq 1\}$ (F) $D_f : \{x|x \geq -1, x \neq -5\}$

_____ 12. Which of the following functions has the following graph of $x \in [-6, 6], x \neq 1$

(A) $f(x) = -\frac{x^2 - 1}{|x + 1|}$

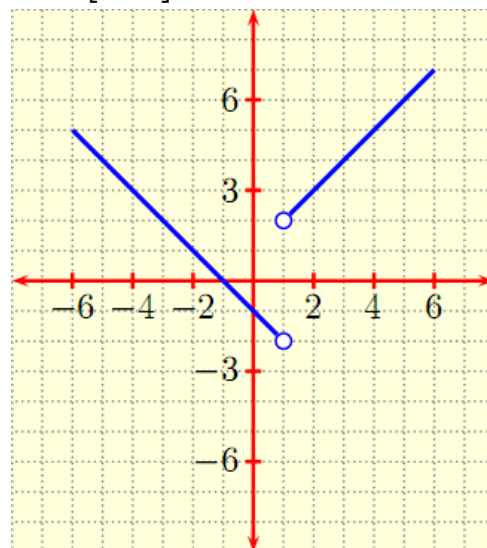
(B) $f(x) = \frac{|x^2 - 1|}{x - 1}$

(C) $f(x) = -\frac{|x^2 - 1|}{x - 1}$

(D) $f(x) = \frac{x^2 - 1}{|x + 1|}$

(E) $f(x) = \frac{x^2 - 1}{|x - 1|}$

(F) $f(x) = -\frac{x^2 - 1}{|x - 1|}$



_____ 13. Which of the following gives the domain of $f(x) = \frac{x}{\sqrt{9-x^2}}$?

- (A) $x \neq \pm 3$ (B) $(-3, 3)$ (C) $[-3, 3]$ (D) $(-\infty, -3) \cup (3, \infty)$ (E) $(3, \infty)$

_____ 14. Which of the following gives the range of $f(x) = 1 + \frac{1}{x-1}$?
(A) $(-\infty, 1) \cup (1, \infty)$ (B) $y \neq 1$ (C) all real numbers (D) $(-\infty, 0) \cup (0, \infty)$ (E) $y \neq 0$

_____ 15. Which of the following gives the range of $y = 4 - 2^{-x}$?
(A) $(-\infty, 2)$ (B) $(-\infty, 4)$ (C) $[-4, \infty)$ (D) $(-\infty, 4]$ (E) all reals

_____ 16. Which of the following gives the domain of $f(x) = 3 - \ln(x+2)$?
(A) $x \neq 2$ (B) $(-\infty, \infty)$ (C) $(-2, \infty)$ (D) $[-1.9, \infty)$ (E) $(0, \infty)$

_____ 17. The domain of the function $f(x) = \ln(x^2 - x - 6)$ is the set of all real numbers x such that
(A) $x > 0$ (B) $-2 \leq x \leq 3$ (C) $x \geq -2$ or $x \geq 3$ (D) $x < -2$ or $x > 3$ (E) $-2 < x < 3$

_____ 18. The domain of $y = \sqrt{(x-1)(x-2)}$ is
(A) $|x| < 2$ (B) $(1, 2)$ (C) $|x| > 2$ (D) $(-\infty, 1] \cup [2, \infty)$ (E) $[1, 2]$