

HOMEWORK EXERCISES (TIME: 10 MINUTES)

21. A function
- q
- is defined as follows:

for $x > 4$, $q(x) = (x - 4)^2 + 3$

for $x \leq 4$, $q(x) = (x - 3)^2 + 4$

What is the value of $q(4)$?

- (A) 1
(B) 3
(C) 5
(D) 7
(E) 9

22. Consider the functions
- $f(x) = (x - 2)^2$
- and
- $g(x) = x + k$
- . If the graph of
- $f(x)$
- passes through the point
- $(5, g(5))$
- , then
- $k = ?$

- (A) 4
(B) 5
(C) 8
(D) 9
(E) 10

23. If
- $f(x) = 400 - 4x^2$
- , then
- $f(f(10)) = ?$

- (A) -639,600
(B) -1200
(C) 0
(D) 400
(E) 16,000

24. Consider the two functions defined as follows:

$$f(x) = \begin{cases} 2^x & x < -1 \\ \frac{3}{2}x + k & x \geq -1 \end{cases}$$

$$g(x) = \begin{cases} 2^x & x \leq -1 \\ \frac{3}{2}x + k & x > -1 \end{cases}$$

If $f(-1) = g(-1)$, then $k = ?$

- (A) -2
(B) $-\frac{3}{2}$
(C) -1
(D) 1
(E) 2

25. At which value(s) of
- x
- is the following function undefined?

$$f(x) = \begin{cases} x + 2 & x < -2 \\ \sqrt{x + 2} & -2 \leq x < 2 \\ x^2 - 2 & x > 2 \end{cases}$$

- (A) -4
(B) -2
(C) 0
(D) 2
(E) 4

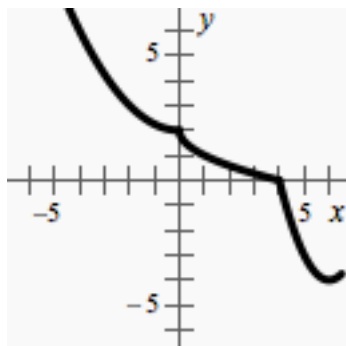
26. Let the operation
- Ωx
- be defined as
- $\frac{x-1}{x+1}$
- . If
- $\sqrt{\Omega k} = \Omega 3$
- , then
- $k = ?$

- (A) $\frac{1}{4}$
(B) $\frac{3}{4}$
(C) 1
(D) $\frac{5}{3}$
(E) 9

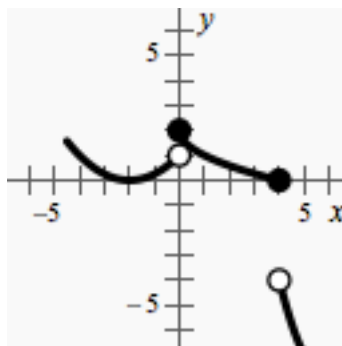
27. Which of the following is the graph of the function $f(x)$ defined below?

$$f(x) = \begin{cases} \frac{1}{4}x^2 + 2 & x < 0 \\ \sqrt{4-x} & 0 \leq x \leq 4 \\ (x-6)^2 - 4 & x > 4 \end{cases}$$

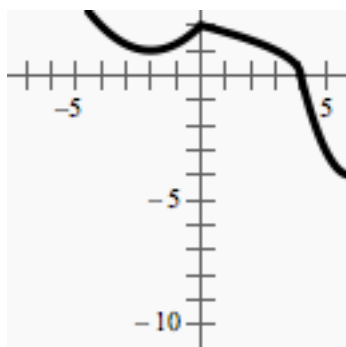
(A)



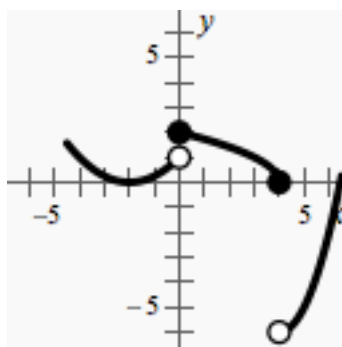
(D)



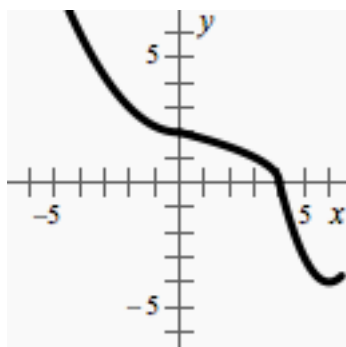
(B)



(E)



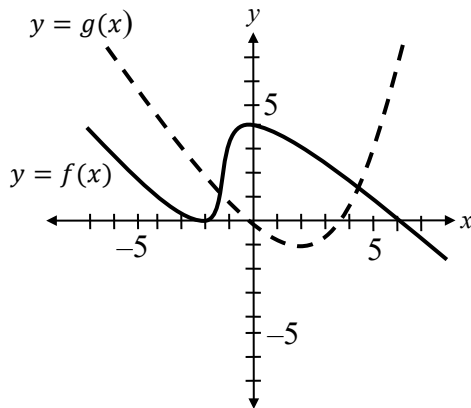
(C)



28. If the function $[x]$ is the greatest integer function, defined for all real numbers x as the greatest integer less than or equal to x , then which of the following MUST be true of the function $f(x) = \frac{[x]}{x}$ whenever $x \neq 0$?

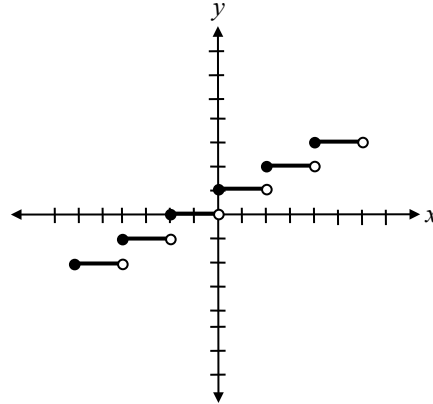
(A) $f(x) > 1$
 (B) $f(x) < 1$
 (C) $f(x) > 0$
 (D) $f(x) = 1$
 (E) None of the above

29. Two functions, f and g , are graphed on the coordinate axes below. Which of the following could be the value of $g(f(3))$?



(A) -2
 (B) -1
 (C) 1.5
 (D) 2
 (E) 4

30. If the function $[x]$ is the greatest integer function, defined for all real numbers x as the greatest integer less than or equal to x , then the graph below could be the graph of which of the following equations?



(A) $y = [2x] + 1$
 (B) $y = \left[\frac{x}{2}\right] + 1$
 (C) $y = \frac{[x]}{2} + 1$
 (D) $y = 2[x] + 1$
 (E) $y = [2x + 1]$