7. If $f(x) = \sqrt{0.3x^2 - x}$ and $g(x) = \frac{x+1}{x-1}$, then $g(f(10)) =$ $g(\sqrt{20})$

(A) 0.2 (B) 1.2 (C) 1.6 (D) 4.5 (E) 5.5

$f(10) = \sqrt{.3(10)^2 - 10}$

$= \sqrt{20}$

$= \frac{\sqrt{20}+1}{\sqrt{20}-1}$

24. What is the domain of $f(x) = \sqrt[3]{-x^2 + 13}$?

(A) $x > 0$
(B) $x > 2.35$
(C) $-2.35 < x < 2.35$
(D) $-3.61 < x < 3.61$
(E) All real numbers

$-x^2+13 \in \mathbb{R}$

29. If $f(2x + 1) = 2x - 1$ for all real numbers x, then $f(x) =$

(A) $-x + 1$

(B) $x - 1$

(C) $x - 2$

(D) $2x - 1$

(E) $\frac{1}{2}x - 1$

$y = 2x + 1$

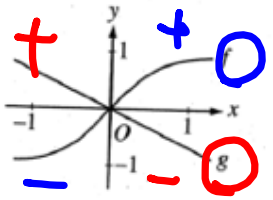
$x = 2y + 1$] inv

$\frac{x-1}{2} = y$

$f(f^{-1}(x)) = x$

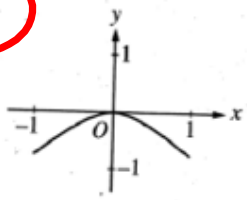
$f\left(2\left(\frac{x-1}{2}\right)+1\right) = 2\left(\frac{x-1}{2}\right) - 1$

$f(x) = x - 1 - 1 = x - 2$

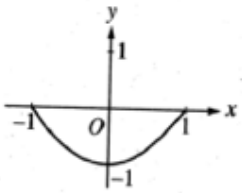


41. Portions of the graphs of f and g are shown above. Which of the following could be a portion of the graph of fg ?

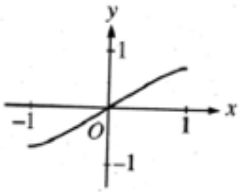
(A)



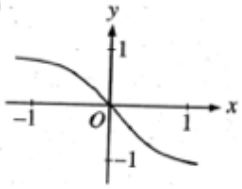
(B)



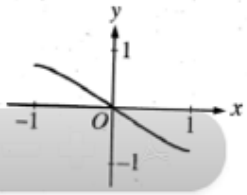
(C)



(D)



(E)



46. Suppose the graph of $f(x) = -x^2$ is translated 3 units left and 1 unit up. If the resulting graph represents $g(x)$, what is the value of $g(-1.6)$?

(A) 2.96
(B) −0.96
(C) −1.56
(D) −1.96
(E) −2.56

$g(x) = -(x+3)^2 + 1$

-1.6

Exercise 1 Suppose that for all $x > 0$ we have $f(2x) = \dfrac{2}{2+x}$. What is $2f(x)$?

(A) $\dfrac{2}{1+x}$ **(B)** $\dfrac{2}{2+x}$ **(C)** $\dfrac{4}{1+x}$ **(D)** $\dfrac{4}{2+x}$ **(E)** $\dfrac{8}{4+x}$

$x \to \frac{x}{2}$

$$f(x) = \frac{2}{2+\frac{x}{2}}$$

$$= \frac{4}{4+x}$$

Exercise 2 The function f is defined for positive integers n by:

$$f(n) = \begin{cases} n+3, & \text{if } n \text{ is odd,} \\ n/2, & \text{if } n \text{ is even} \end{cases}$$

Suppose k is an odd integer and that $f(f(f(k))) = 27$. What is the sum of the digits of k?

(A) 3 **(B)** 6 **(C)** 9 **(D)** 12 **(E)** 15

① ~~②~~

② $\frac{n}{2} = 27$

$n = 54$

$n+3 = 27$

$n = 24$

$f(f(k)) = 54$

① $n+3 = 54$ ① $\frac{n}{2} = 54$

$n = 51$ $n = 108$

$f(k) = 51$ or $f(k) = 108$

~~①~~ $n+3 = 51$ ② $\frac{n}{2} = 51$ ① $n+3 = 108$

$n = 48$ ✓ $n = 102$ $n = 105$ ✓

$K = 102$ $K = 105$

② $\frac{n}{2} = 108$

$n = 216$

$K = 216$ ✓

20. If a and b are in the domain of a function f and $f(a) < f(b)$, which of the following must be true?

(A) $a = 0$ or $b = 0$
(B) $a < b$
(C) $a > b$
(D) $a \neq b$
(E) $a = b$

31. What is the range of the function defined by

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

(A) $y > 2^{\frac{1}{3}}$

(B) $y \leq 3$

(C) $2^{\frac{1}{3}} < y < 3$

(D) $y \geq 3$

(E) All real numbers

or

$x > 2$

① $x^{\frac{1}{3}} > \sqrt[3]{2}$

or

$x \leq 2$

$2x \leq 4$

② $2x - 1 \leq 3$