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Oromia Development Association Special Boarding School

FIRTS SEMESTER MATHEMATICS FIRST TEST FOR GRADE 11 IN 2013 E.C
YOU ARE ALLOWED TO WORK ON THE TEST FOR 1:00 HOURS

**I. CHOOSE THE CORRECT ANSWER FROM THE GIVEN ALTERNATIVES
AND WRITE YOUR CHOICE ON THE SPACE PROVIDED.**

1. Which of the following is the range of floor function?

- A. Real number B. Natural number C. Integers D.
Rational numbers

2. Which one of the following is not true?

A. A set of points in the Cartesian plane is the graph of a function, if and only if no vertical line intersects the set more than once

B. For the function $f(x) = \sqrt[3]{x}$, Domain of f = Range of f

C. A function $f: A \rightarrow B$ is a bijection if and only if f is one-to-one and onto

D. For a, b, c, d constants with $ad - bc \neq 0$, $f(x) = \frac{ax+b}{cx+d}$ is not one-to one function

3. Which of the following is one- to-one correspondence function from $A = [0, 1]$ to $B = [1, 2]$?

- A. $f(x) = x$ B. $f(x) = \frac{x^3}{3} + 1$ C. $f(x) = 2x+1$ D. $f(x) = x^2 + 1$

4. Which of the following function is invertible on $\mathbb{R}$?

- A. Modulus function B. Linear function
C. Quadratic function D. Cubic function

5. If $f(x) = 2x + 5$ and $g(x) = 3x^2 + 2x + 4$, then $(f \circ g)(2)$ is equal to

- A. 40 B. 45 C. 12 D. 20

6. If $g(x) = 3x - 5$ and $(g \circ f)(x) = 3x^2 + 6x + 1$, then $f(x)$ is equal to

- A. $x^2 + x + 1$ B. $2x^2 + 2$ C. $x^2 + 2x + 2$ D. $3x^2 - 3x + 1$

7. What is the inverse of $f(x) = \frac{x+2}{2x+3}$?

- A. $\frac{2x-1}{-3x+3}$ B. $\frac{x-2}{2x-3}$ C. $f(x) = \frac{-3x+2}{2x-1}$ D. $\frac{3x+2}{x+2}$

8. If $f(x) = \frac{1}{2+x}$, then what is the value of $g(x) = \frac{1}{2+f\left(\frac{1}{x+2}\right)}$ for $x \neq -2, -1, -\frac{3}{2}$?

- A. $\frac{8x+3}{3x+2}$ B. $\frac{5x+8}{2x+3}$ C. $\frac{5x+12}{2x+5}$ D. $\frac{2x+5}{5x+12}$

9. Which of the following functions is neither even nor odd?

- A. $f(x) = x - 1$ B. $g(x) = x^4$ C. $h(x) = x^5$ D. $k(x) = 2x^3 - 3|x|$

10. What is the solution set of $1 - \frac{5}{x^2+4} = \frac{x-1}{x^2-x} - \frac{1}{x}$?

- A. $[-1, 1]$ B. $\{-1\}$ C. $\{2\}$ D. $[-1, 1, 2]$

11. Which of the following algebraic expressions is rational expression?

- A. $\left| \frac{x^2+1}{x+1} \right|$ B. $\frac{x^2 + \cos x + 2}{x+1}$ C. $3x^4 - \sqrt{x^3+1} + 2x$ D. $\frac{\sqrt{2} x^3 - x + \log 2}{x^4 + x^2 + \pi}$

12. Given $f(x) = 2x \operatorname{sgn} x + 4$, which of the following is the domain and range of $f(x)$?

A. $\operatorname{Dom} f(x) = \mathbb{Z}$, $\operatorname{Range} f(x) = [4, \infty)$
 $(-\infty, 4]$

B. $\operatorname{Dom}(f) = \mathbb{R}$, $\operatorname{Range}(f) =$

C. $\operatorname{Dom}(f) = \mathbb{R}$, $\operatorname{Range}(f) = [-2, \infty)$
 $(f) = (-\infty, -4]$

D. $\operatorname{Dom}(f) = \mathbb{R}$, Range

13. which of the following is not correct?

A. $f(x) = \operatorname{sgn} x = |x|$

B. $f(x) = x^3 \operatorname{sgn} x$ is even function

C. $f(x) = x^2 \operatorname{sgn} x$ is odd function

D. If $f(x) = |x|$, then $f(f(-3)) \neq (-2.7)$

14. Given that $f(x) = \frac{x-1}{x+1}$, then what is the simplest form of $\frac{f(a)-f(b)}{1+f(a)f(b)}$?

A. $\frac{ab+1}{a-b}$, $a \neq b$ B. $\frac{a-b}{ab+1}$, $ab \neq -1$ C. $\frac{a+b}{ab+1}$; $ab \neq -1$ D. $\frac{a-b}{ab-1}$; $ab \neq 1$

15. Which of the following is NOT proper rational expression?

A. $f(x) = \frac{x+1}{x^2-4}$ B. $f(x) = \frac{x-1}{x^2-9}$ C. $f(x) = \frac{x}{x^2-9}$ D.

$f(x) = \frac{x^3}{x^2-9}$

16. A father is now four times as old as his son. If both he and his son live 20 years longer, he will be twice as old as his son. What is the present age of the son?

A. 20 B. 15 C. 10 D. 40

17. Which of the following is true about the function $f(x) = \frac{x^2+3x+2}{x^2-2x-3}$?

- A. The graph of f has vertical asymptote at $x=-1$
- B. The graph of f has a Horizontal asymptote at $y=3$
- C. The graph of f has oblique asymptote at $y=1$
- D. None of the above

18. Which of the following functions has NO Vertical asymptote ? A.

$f(x) = \ln(x+2)$ B. $f(x) = \frac{x^2 + 3x + 2}{x^2 - x}$ C. $f(x) = \frac{x^2 - 1}{x^3 + 8}$ D. $f(x) = \frac{x^2 - 4}{x - 2}$

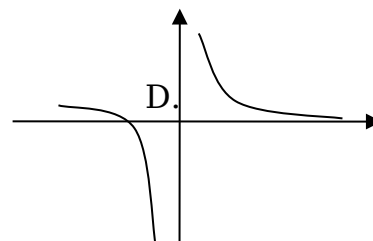
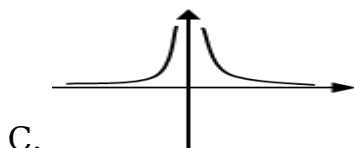
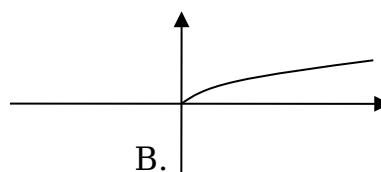
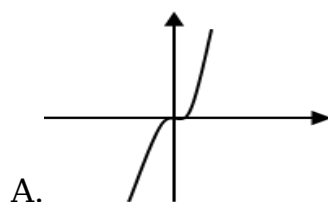
19. For the function $f(x) = x^2 \sin x$, what is its Domain and Range ?

- | | |
|---|---|
| <p>A. $\text{Domain} = \mathbb{R}$
$\text{Range} = [0, \infty)$</p> <p>C. $\text{Domain} = [0, \infty)$
$\text{Range} = \mathbb{R}$</p> | <p>B. $\text{Domain} = \mathbb{R}$
$\text{Range} = \mathbb{R}$</p> <p>D. $\text{Domain} = [0, \infty)$
$\text{Range} = [0, \infty)$</p> |
|---|---|

20.

Which of the following graphs is the possible graph of the function

$f(x) = x^{\frac{n}{m}}$ n is even negative integer and m is odd



21. From the following which one is not one-to-one ?

A. $f: (-\infty, -1] \rightarrow [1, \infty); f(x) = \sqrt{1-x}$

B. $f: \{(1, -2), (1, 2), (0, 20), (-2, -3)\}$

C. $h: \mathbb{R} \rightarrow [0, \infty); h(x) = |2-3x|$

D. $f: \mathbb{R} \rightarrow \mathbb{R}; f(x) = 3 - \frac{1}{3}x$

22. What is the set of value of A, for which $f: A \rightarrow [-2, \infty)$ defined by $f(x) = x^2 + 6x + 7$ is onto? A. $(-\infty, -1]$ B. $[-3, \infty)$
C. $[-4, \infty)$ D. $\mathbb{R}$

23. If $f(x) = \frac{1}{1+x}$, then what is the value of $g(x) = \frac{1}{1+f\left(\frac{1}{x+1}\right)}$ for $x \neq -2, -1, -\frac{3}{2}$?

A. $\frac{x+1}{x+2}$

B. $\frac{x+2}{x+3}$

C. $\frac{x+2}{2x+3}$

D. $\frac{2x+3}{x+2}$

24. If $f(x) = ax+b, g(x) = x^2+2x, (f \circ g)(2) = 1, (f \circ g)(-1) = -1$, then this of the following is Not TRUE?

A. $(f \cdot g)(x) = \frac{1}{9}(2x^3 - 3x^2 - 14x)$

C. $(f-g)(0) = -3$

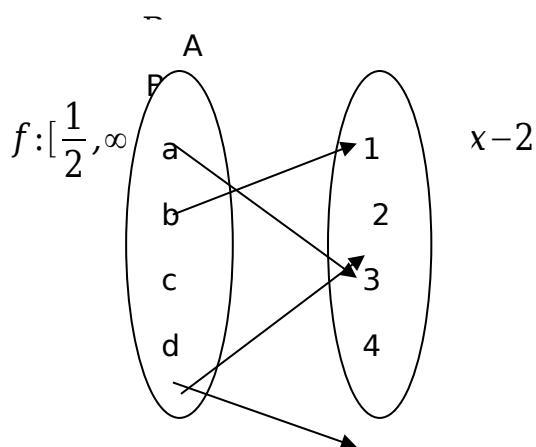
B. $\left(\frac{f}{g}\right)(1) = -\frac{5}{27}$

D. $(f+g)(-1) = -2$

25. Which one of the following is Bijective?

A. $f: [0, \infty) \rightarrow \mathbb{R}, f(x) = 3 - |x|$

C.



D. $\mathbb{R} \rightarrow \mathbb{R} f(x) = 1 - x^3$

26. If $f(x) = \frac{3}{x-1}$ and $(f \circ g)(x) = \frac{3x}{2-x}$, then $g(x) =$ _____

- A. $\frac{6}{2-x}$ B. $\frac{2}{x}$ C. $3x$ D. $\frac{2}{x-1}$

27. Which of the following functions is neither even nor odd?

- A. $f(x) = x-1$ B. $g(x) = x^4$ C. $h(x) = x^5$ D. $k(x) = 2x^3 - 3|x|$

28. Given $f(x) = \frac{x-2}{x-1}$ and $h(x) = f\left(\frac{1}{x}\right)$, then which of the following is NOT TRUE?

- A. Domain of $h(x) = \mathbb{R} \setminus \{1\}$ C. $h(x) = \frac{1-2x}{1-x}, x \neq 0, 1$
 B. $x=0$ is vertical asymptote of $h(x)$ D. $h\left(\frac{1}{x}\right) = f(x), x \neq 0, 1$

29. Which of the following functions has an inverse function, if f is

- defined as $f: \mathbb{R} \rightarrow \mathbb{R}$? A. $f(x) = |x|$ B. $f(x) = \begin{cases} x, & x \geq 0 \\ 0, & x < 0 \end{cases}$ C. $f(x) = x^2 + 1$
 D. $f(x) = x^3 + 1$

30. Which of the following is the inverse of $k(x) = 2 + \ln(x-1)$?

- A. $h(x) = 2 + e^{x-1}$ B. $h(x) = 1 + e^{x-2}$ C. $h(x) = 2 - e^{x-1}$ D. $h(x) = 1 - e^{x-2}$

31. The **inverse** of $f(x) = \frac{10^x - 10^{-x}}{10^x + 10^{-x}} + 1$ is= _____

- A. $\frac{x}{2-x}$ B. $\log_{10} \sqrt{\frac{x}{2-x}}$ C. $\sqrt{\frac{x}{2-x}}$ D. $\log_{10} x$

32. If $f(x) = \frac{\sqrt{x+2}}{x+2}$ and $g(x) = \frac{1}{x} - 2$, then $f(g(x))$ is equal to:

- A. $\sqrt{x} - 2$ B. $\sqrt{x} + 2$ C. $\sqrt{x}$ D. $\frac{\sqrt{x}}{x}$

33. If $f(x) = \ln\left(\frac{x}{x-1} + 2\right)$, for $x > 1$, then which of the following is the inverse of f ?

- A. $g(x) = \frac{e^x - 2}{e^x - 3}$ B. $g(x) = \frac{e^x - 2}{e^x + 1}$ C. $g(x) = \frac{e^x}{e^x + 1} - 2$ D. $g(x) = e^{\frac{x}{x-1}} - 2$

34. Which one of the following is a one-to-one function?

- A. $f = \{(1, 6), (2, 7), (3, 7), (4, 8)\}$ C. $k: (0, \infty) \rightarrow \mathbb{R}$ given by $h(x) = \log x$
 B. $k: \mathbb{R} \rightarrow \mathbb{R}$ given by $h(x) = |x - 3|$ D. $g = \{(x, y): x \text{ is a student and } y \text{ is his/her rank}\}$

35. If $f(x) = \ln(x+1)$ and $g(x) = x^3 + 7$, then what is the domain of $(f \circ g)(x)$?

- A. $(-2, \infty)$ B. $(-1, \infty)$ C. $[-2, \infty)$ D. $\emptyset$

36. If $f(x) = \frac{1}{e^x + 1}$, then which of the following is equal to $f^{-1}(x)$?

- A. $\ln(1-x) - \ln(x)$ B. $e^{-x} + 1$ C. $\ln\left(\frac{1}{x+1}\right)$ D. $\frac{1}{e^{-x} + 1}$

37. If $f(x) = \sqrt[3]{1+e^{-x}}$, which of the following is equal to $f^{-1}(x)$?

- A. $\ln\left(\frac{1}{x^3 - 1}\right)$ B. $\frac{1}{\ln(x^3 - 1)}$ C. $\ln(1 - x^3)$ D. $(1+e^{-x})^3$

38. If $f(x) = \frac{x+1}{x-1}$ and $f(a) = 5$ then $f(2a)$ is equal to:

- A. 2 B. 4 C. 6 D. 8

39. Which of the following functions is a one-to-one correspondence?

- A. $f: \mathbb{R}' \rightarrow \mathbb{R}$, $f(x) = \tan x$, where $\mathbb{R}'$ is the domain of f .
 B. $g: \mathbb{R} \rightarrow \mathbb{R}$, $g(x) = 2^x$
 C. $h: [0, \infty) \rightarrow [0, \infty)$, $h(x) = x^2$
 D. $r: [0, \infty) \rightarrow [0, \infty)$, $r(x) = x+5$

40. Which one of the following is a one-to-one correspondence function from $A = [0, 1]$ to $B = [1, 2]$?

- A. $f(x) = x$ B. $f(x) = \frac{1}{3}x^3 + 1$ C. $f(x) = 2x + 1$ D. $f(x) = x^2 + 1$
41. If $f: A \rightarrow B$ and $g: B \rightarrow C$ are functions, then which one of the following is true about the composition function?
- A. Domain of $(g \circ f) \subseteq$ Domain of f . C. Domain of $(g \circ f) \not\subseteq$ Domain of f .
 B. Range of $(g \circ f) \not\subseteq$ Range of g . D. Range of $(g \circ f) \subseteq$ Range of f .
42. If the point $(3, -2)$ is on the graph of $y = f(x)$, which point is on the graph of $y = f^{-1}(x)$?
- A. $\left(\frac{1}{3}, -2\right)$ B. $(3, -1)$ C. $(-2, 3)$ D. $\left(3, -\frac{1}{2}\right)$
43. Which of the following is **NOT** true?
- A. The range of the inverse of the relation $R = \{(x, y) | y > x^2 \text{ and } y \leq 4\}$ is $\{y | -2 \leq y \leq 2\}$.
 B. The domain of the relation $R = \{(x, y) | x - y < 2 \text{ and } x > 0\}$ is $\{x | x > 0\}$.
 C. If R is a relation on the set of real numbers, then the graph of R^{-1} can be obtained by reflecting the graph of R along the line $y = x$.
 D. A function is a relation.
44. If $f: \mathbb{R} \rightarrow \mathbb{R}$ is a function, then which of the following is necessarily **true**?
- A. If f is one-to-one, then it is onto. C. If f is odd, then $f \circ f$ is odd.
 B. If f is onto, then it is one-to-one. D. If f is odd, then f^{-1} is even.
45. Suppose $f(1) = 3$, and $n = 2, 3, 4, \dots, f(n) = 1 + f(n-1)$. Which of the following is true?
- A. $f(37)$ is a prime number. C. If $f(n)$ is odd composite number, then n is even.
 B. For any natural number n , $f(f(n)) = n + 6$ D. $\sum_{i=1}^n f(i) = \frac{n(n+5)}{2}$
46. If $f(x) = 2x + 1$ and g is a function such that $f(g(2)) = 3$, then $g(2)$ is equal to:
- A. 1 B. 5 C. 7 D. 3
47. Let $f(x) = 3^x$. Then which of the following is **true** for each real numbers x and y ?

A. $f(x+y) = f(x) + f(y)$

B. $f(xy) = f(x)f(y)$

C. $f(x^2+1) = \frac{1}{3}f(x^2)$

D. $f(x-1) < f(x)$

48. Given functions $f(x) = x^2 - x + 3$ and $g(x) = \begin{cases} \frac{1}{x-1}, & \text{if } x < 3 \\ x^2 + 1, & \text{if } x \geq 3 \end{cases}$, then $(g \circ f)(2)$ is equal to:

A. $\frac{1}{4}$

B. 3

C. 26

D. 82

49. Which of the following is **NOT** true about the function $f(x) = x^2$?

A. It is an even function.

C. Its range is $\mathbb{R}$.

B. Its graph has a vertical asymptote.

D. Its domain is $\mathbb{R} \setminus \{0\}$.

50. Which of the following relation is the inverse of the relation $R = \{(x, y) : y \geq 2x - 6 \text{ and } 2y - x < 8\}$?

A. $\{(x, y) : y \geq \frac{1}{2}x + 3 \text{ and } y < 2x - 8\}$

C. $\{(x, y) : y \leq \frac{1}{2}x + 3 \text{ and } y > 2x - 8\}$

B. $\{(x, y) : x \leq 2y - 6 \text{ and } 2x - y > 8\}$

D. $\{(x, y) : y \leq 2x - 6 \text{ and } 2y - x > 8\}$

51. If $g(x) = 2x - 3$ and $(f \circ g)(x) = \frac{1}{4x - 9}$, then $f(x)$ is equal to:

A. $f(x) = \frac{1}{2x + 3}$

B. $f(x) = \frac{1}{2x - 15}$

C. $f(x) = \frac{1}{2x + 15}$

D.

$f(x) = \frac{1}{2x - 3}$

52. Which of the following functions is an odd function?

A. $f(x) = x^3(x+1)$

C. $f(x) = x^3 - 7$

B. $f(x) = x^2(x - x^2)$

D. $f(x) = |x| - 1$

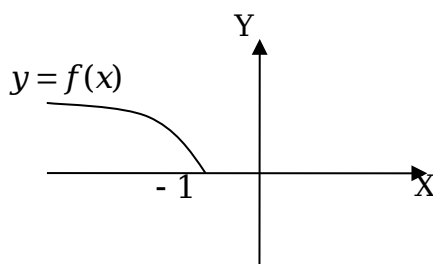
53. Which of the following functions can be a possible representation of the graph shown below?

A. $f(x) = \sqrt{1-x}$

B. $f(x) = \sqrt{-x-1}$

C. $f(x) = \sqrt{x+1}$

D. $f(x) = \sqrt{x-1}$



54. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: \mathbb{R} \setminus \{0\} \rightarrow \mathbb{R} \setminus \{0\}$ be two functions defined as $f(x) = x+1$ and $g(x) = \frac{1}{x}$. Which of the following statements is **NOT** true?

- A. $f(f^{-1}(x)) = x$ for all $x \in \mathbb{R}$.
 B. $f(g(x)) = \frac{x+1}{x}$.
 C. $f(g(-2)) = \frac{1}{2}$.
 D. $g(f(-1)) = 0$.

55. Which of the following graphs is the possible graph of the function $f(x) = x^{-n}$, n is even positive integer?



56. If $f(x) = kx + c$, $k \neq 0$, then what is $h(x)$ such that $(hof)(x) = x$?

- A. $h(x) = \frac{1}{k}x - \frac{c}{k}$
 B. $h(x) = kx + ck$
 C. $h(x) = \frac{1}{k}x$
 D. $h(x) = 2kx$

57. Given $f(x) = \log_3 x$ and $g(x) = x^2 + 3$, then which of the following is **true**?

- A. Domain of $(fog)(x) = (0, \infty)$
 B. Range of $(fog)(x) = [1, \infty)$
 C. Domain of $(gof)(x) = (-\infty, \infty)$
 D. $(gog)(x) = (\log_3 x)^2$

58. Which of the following pairs of equations **does not** determine the same graph?

- A. $y = x \operatorname{sgn} x$ and $y = |x|$
 B. $y = |x^3|$ and $y = x^3 \operatorname{sgn} x$
 C. $y = x^2 \operatorname{sgn} x$ and $y = x^2$
 D. $y = \log \sqrt{x^2}$ and $y = \log |x|$

59. The inverse of $f(x) = \log_3 \sqrt{x-1}$ is

- A. $f^{-1}(x) = 3^x + 1$
 B. $f^{-1}(x) = 3^{3x} + 2$
 C. $f^{-1}(x) = 3^{2x} + 1$
 D. $f^{-1}(x) = 3^{2x} + 3$

60. The simplest form of the expression $\frac{\frac{1}{x+2} + \frac{4}{x-3}}{\frac{2}{x-3} - \frac{7}{x+2}}$ when $x \neq -2, 3$ is
- A. $\frac{x+1}{5+x}$ B. $\frac{x+1}{5-x}$ C. $\frac{x+5}{1+x}$ D. $\frac{x-5}{1+x}$

61. Which one of the following is not true about the function $f(x) = \frac{3x-2}{4-5x}$

and $g(x) = \frac{3-2x}{4x-1}$?

A. $(g \circ f)(x) = \frac{16-21x}{19x-12}$

B. $f(x)^{-1} = \frac{4x+2}{5x+3}$

C. $g(x)^{-1} = \frac{3+x}{4x+2}$

D. $(f \circ g) = \frac{11-14x}{26x-19}$

62. Let $f(x) = \frac{1-x}{1+x}$, then $f\left(\frac{\sqrt{x^2+1}}{x+5}\right)$ is equal to

A. $\frac{x+5}{x^2+1}$

B. $\frac{\sqrt{x^2+1}}{x+5}$

C. $\sqrt{\frac{x^2+1}{x+5}}$

D.

$\sqrt{\frac{x+5}{x^2+1}}$

63. Let $f(x) = \frac{x^2 - x - 2}{x^2 - 1}$, then which one of the following is not true about the graph of f ?

A. It cuts the y-axis at (0,2)

B. It has hole at $x=-1$

C. It cuts the x-axis at (-2,0)

D. The line $y=1$ is the

horizontal asymptote

64. What is the solution set of the inequality $\frac{x^2 - 3x + 2}{4x^2 - 4x + 1} > 0$?

A. $(-\infty, 1) \cup (2, \infty)$ B. $(-\infty, \frac{1}{2}) \cup (1, 2)$ C. $(-\infty, \frac{1}{2}) \cup (2, \infty)$ D. $(-\infty, \frac{1}{2}) \cup (\frac{1}{2}, 1) \cup (2, \infty)$

65. What is the value of A, B and C respectively, if the partial

decomposition of $\frac{5x^2 - 9x + 19}{x^3 - 4x^2 + 5x - 20}$

$$= \frac{A}{x-4} + \frac{Bx+C}{x^2+5}$$

A. -1, 2, 3

B. 2, -1, 3

C. 3, 2, -1

D. 2, 3, -1

66. Which of the following pair of function is not the inverse of each other ?

A. $f(x) = x^3 - 8$ and $\sqrt[3]{x^3 + 8}$

B. $f(x) = \sqrt{x}$ and $g(x) = x^2$

C. $f(x) = \ln\left(\frac{x}{x-1} + 2\right)$ and $g(x) = \frac{e^x - 2}{e^x - 3}$

D. $f(x) = 3x + 2$ and $g(x) = \frac{x+2}{3}$

67. If $f(x) = 4x + 1$ and $g(x) = 3x + k$, then the value of k for which $(f \circ g)(x) = (g \circ f)(x)$ is

A. $\frac{2}{3}$

B. $\frac{3}{2}$

C. $\frac{1}{3}$

D.

$\frac{1}{2}$

68. Which of the following is True ?

A. In rational expression $\frac{p(x)}{q(x)}$, if the degree of $p(x)$ is less than that of $q(x)$, then the expression is improper

B. In rational expression $\frac{p(x)}{q(x)}$ if the degree of $p(x)$ is greater than or equal to that of $q(x)$, then the expression is proper

C. In rational expression $\frac{p(x)}{q(x)}$ if the degree of $p(x)$ is less than or equal to that of $q(x)$, then the rational function has horizontal asymptote.

D. $ax^2 + bx + c$ is reducible in R if $b^2 - 4ac \geq 0$