

# Chapter Eight: Functions and Graph of Functions

## Creative Essay Type

1. ▶  $f(x) = \tan^{-1} \left( \frac{1}{1+x+x^2} \right)$  is a 'FUNCTION' and  $4x + 3y + 5 = 0$ ,  $15x - 8y + 3 = 0$  are two straight lines.

*[RAJUK Uttara Model College, Dhaka]*

- a. Find the number of ways in which the letters of the above the capital English word may be arranged, the vowel do not occur in consecutive positions. 2
- b. Using the function of the stem, show that,  $f(0) + 2f(1) + f(2) = \frac{\pi}{2}$ . 4
- c. Bisector of angles between the two straight lines of the stem, intersect y-axis at point C and D. Find the length of CD. 4

**Ans:** See HSC EV Higher Mathematics 1st Paper 8th Chapter Note Ques. No. 12 of Answer Paper.

2. ▶ In the question of MATHEMATICS,  $f(x) = \frac{7x+3}{5x-7}$  is a onto function.

*[Birshreshtha Noor Mohammad Public College, Dhaka]*

- a. If  ${}^n P_r = 240$  and  ${}^n C_r = 120$  then find the value of n and r. 2
- b. Determine whether the function in the stem is one-one or not. If it is one-one function then find  $f^{-1}(x)$ . 4
- c. In how many different ways can the letters of the quoted English word be arranged taking all letters at time? In how many different ways can the letters of that word be arranged so that the vowels do not occupy consecutive positions? 4

**Ans:** See HSC EV Higher Mathematics 1st Paper 8th Chapter Note Ques. No. 13 of Answer Paper.

3. ▶ Scenario 1:  $\vec{p} = 2\hat{i} + 3\hat{j} - 4\hat{k}$ ,  $\vec{Q} = 5\hat{i} - 4\hat{j} - \lambda\hat{k}$

Scenario 2:  $f(x) = x^2 - 2|x|$ ,  $g(x) = x^2 + 1$

*[Dhaka Residential Model College, Dhaka]*

- a. If  $\vec{p}$  and  $\vec{Q}$  are perpendicular, find the value of  $\lambda$ . 2
- b. Find the angles which makes the vector  $\vec{p}$  with the coordinate axis. 4
- c. Find the value of  $(f \circ g)(-2)$  and  $(g \circ f)(-4)$ . 4

**Ans:** See HSC EV Higher Mathematics 1st Paper 8th Chapter Note Ques. No. 14 of Answer Paper.

4. ▶  $A = \begin{bmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{bmatrix}$ ,  $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

*[BAF Shaheen College, Dhaka]*

- a.  $f: \mathbb{R} \rightarrow \mathbb{R}$ , and  $f(x) = 2x - 1$ , then find  $f^{-1}$  2
- b. If  $AX = \begin{bmatrix} -1 \\ 0 \\ 2 \end{bmatrix}$  then, solve the equation group by creamer's rule. 4
- c. Show that,  $AA^{-1} = I$  where, I is an identity matrix. 4

**Ans:** See HSC EV Higher Mathematics 1st Paper 8th Chapter Note Ques. No. 15 of Answer Paper.

5. ▶  $f: \mathbb{R} \rightarrow \mathbb{R}$ ;  $f(x) = x^3 + 1$

*[Chattogram Cantonment Public College, Chattogram]*

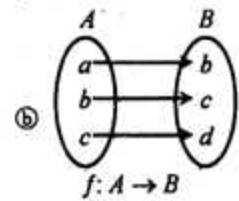
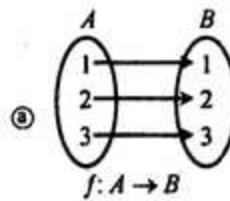
- a. A candidate is asked to answer 6 questions out of 12 questions. He has to select exactly 4 questions from the fist 5 questions. In how many ways be can selected the questions 2

- b. Show that the function  $f(x)$  is one-one & onto. 4
- c. How many significant odd numbers of five digits can be formed with digits expressing by  $f(-1)$ ,  $f(0)$ ,  $f(1)$ ,  $f(2)$ ,  $\frac{f(3)}{4}$  using each digit only once in a number. 4

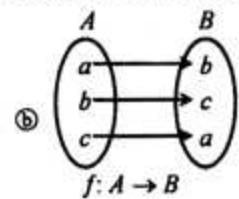
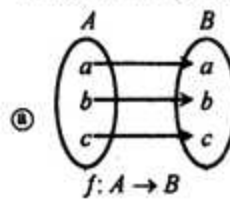
**Ans:** See HSC EV Higher Mathematics 1st Paper 8th Chapter Note Ques. No. 17 of Answer Paper.

## Creative Multiple Choice

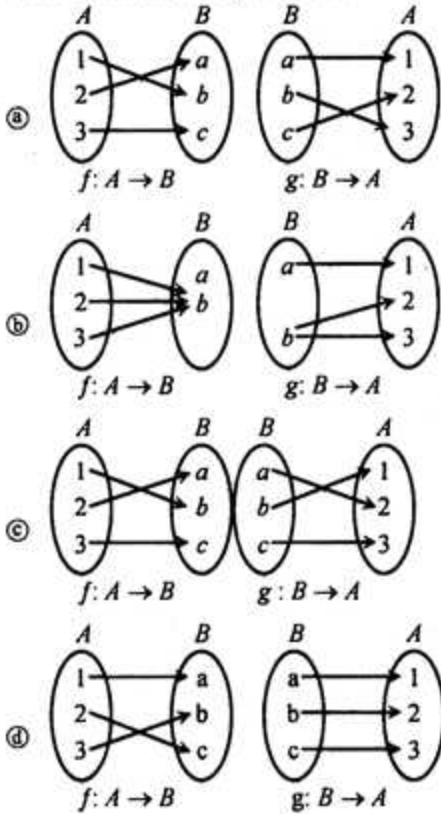
1. If  $A = \{a, b\}$ ,  $B = \{1, 2, 3\}$ , what is the value of  $n(A \times B)$ ?  
 Ⓐ 4 Ⓑ 5  
 Ⓒ 6 Ⓓ 9 Ⓒ
2. If  $f(x) = \begin{cases} x^2 - 3x, & x \geq 0 \\ x + 2, & x < 0 \end{cases}$  then  $f(-2) = ?$   
 Ⓐ -1 Ⓑ 0  
 Ⓒ 4 Ⓓ 10 Ⓑ
3. Which one of the following functions is one-one and onto?  
 Ⓐ  $f(x) = x^2$  Ⓑ  $f(x) = |x|$   
 Ⓒ  $f(x) = \sin x$  Ⓓ  $f(x) = \frac{3x+2}{5}$  Ⓓ
4. Which of the following represents identity function?



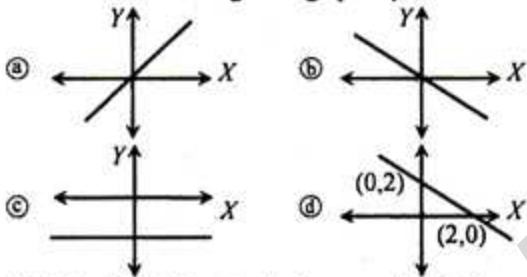
5. Which of the following is constant function?



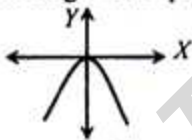
6. Which of the following is correct if  $g : B \rightarrow A$  is the inverse function of  $f : A \rightarrow B$ ?



7. Which of the following is the graph of  $y = -x$ ?

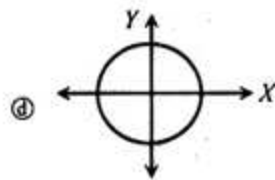
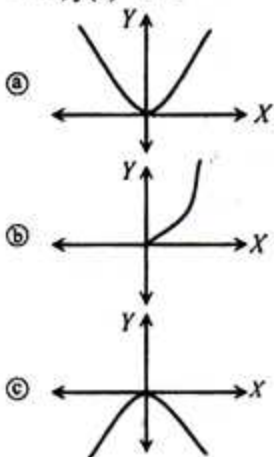


8. Which of the following is the equation of the graph?

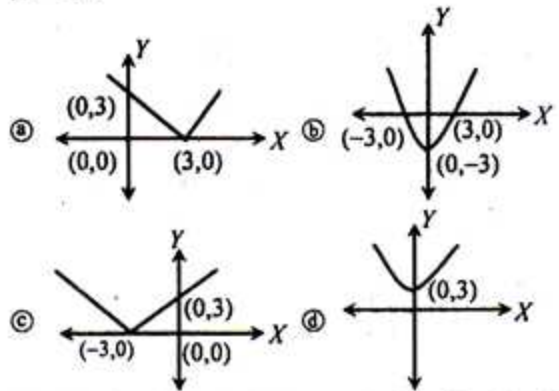


- (a)  $y = -x^2$       (b)  $y = x^2 - 3$   
 (c)  $y = -x^2$       (d)  $y = \sqrt{x}$

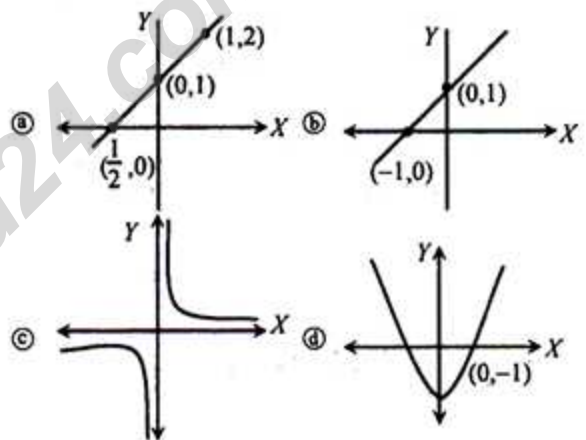
9. Which of the following is the graph of the function  $f : [0, \infty) \rightarrow \mathbb{R}, f(x) = x^2$ ?



10. Which of the following is the graph of the function  $y = |x - 3|$ ?



11. Which of the following is the graph of the function  $f(x) = \frac{x^2 - 1}{x - 1}$ ?



12. What is the domain of  $y = \frac{3x + 1}{2x + 5}$ ?

- (a)  $\mathbb{R}$       (b)  $\mathbb{R} - \left\{-\frac{5}{2}\right\}$   
 (c)  $\mathbb{R} - \left\{\frac{5}{2}\right\}$       (d)  $\mathbb{R} - \{0\}$

13. What is the range of  $y = \frac{x - 3}{3x + 1}$ ?

- (a)  $\mathbb{R} - \left\{-\frac{1}{3}\right\}$       (b)  $\mathbb{R}$   
 (c)  $\mathbb{R} - \left\{\frac{1}{3}\right\}$       (d)  $\mathbb{R} - \{3\}$

14. Which of the following is the inverse function of  $f(x) = 3x - 6$ ?

- (a)  $6x - 3$       (b)  $\frac{x + 6}{3}$   
 (c)  $3x + 6$       (d)  $\frac{1}{3x - 6}$



15. If  $f: \mathbb{R} \rightarrow \mathbb{R}$  is defined as  $f(x) = x^2 + 1$  then  $f^{-1}(0) =$  what?

- Ⓐ  $\{i, -i\}$                       Ⓑ  $\mathbb{R}$   
 Ⓒ  $\{\}$                               Ⓓ undefined

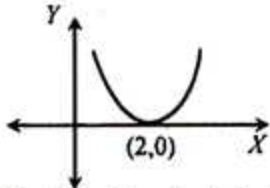
16. If  $f(x) = \sqrt{x-1}$ ,  $f^{-1}(2) =$  what?

- Ⓐ  $-1$                               Ⓑ  $1$   
 Ⓒ  $3$                                 Ⓓ  $5$

17. Which of the following is the domain of  $y = e^{\frac{1}{x}}$ ?

- Ⓐ  $[0, \infty)$                         Ⓑ  $\mathbb{R}$   
 Ⓒ  $\mathbb{R} - \{0\}$                       Ⓓ  $[1, \infty)$

18.



Which of the following is the function of the above graph?

- Ⓐ  $y = x^2$                         Ⓑ  $y = (x-2)^2$   
 Ⓒ  $y = (x+2)^2$                 Ⓓ  $y = x^2 + 2$

19. If  $f(x) = \log x$  then —

- i.  $f^{-1}(x) = 10^x$                 ii.  $D_f = \mathbb{R}$   
 iii.  $R_f = \mathbb{R}$

Which of the following is correct?

- Ⓐ i and ii                        Ⓑ i and iii  
 Ⓒ ii and iii                      Ⓓ i, ii and iii

20. If  $f(x) = x^2 - 1$ ,  $g(x) = \sqrt{x}$ , then —

- i.  $gof(1) = 0$                     ii.  $fog(1) = 0$   
 iii.  $fog(x) = gof(x)$

Which of the following is correct?

- Ⓐ i and ii                        Ⓑ i and iii  
 Ⓒ ii and iii                      Ⓓ i, ii and iii

21. If  $f(x) = x^2 + 5$ , then  $f(x)$  is —

- i. an onto function                ii. an one-one function  
 iii. a constant function

Which of the following is correct?

- Ⓐ i and ii                        Ⓑ i and iii  
 Ⓒ ii and iii                      Ⓓ i, ii and iii

22. Of the function  $f(x) = 3^x$  —

- i. Domain  $[0, \infty)$                 ii. Range  $(0, \infty)$   
 iii.  $f^{-1}(x) = \frac{\ln(x)}{\ln 3}$

Which of the following is correct?

- Ⓐ i and ii                        Ⓑ i and iii  
 Ⓒ ii and iii                      Ⓓ i, ii and iii

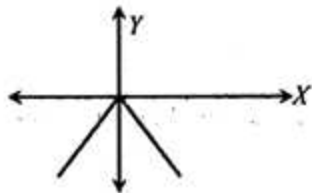
23. If  $f: [0, \infty) \rightarrow [1, \infty)$ ,  $f(x) = x^2 + 1$  then —

- i.  $f(x)$  is one-one function.  
 ii.  $f(x)$  is onto function        iii.  $f^{-1}(x)$  exists

Which of the following is correct?

- Ⓐ i and ii                        Ⓑ i and iii  
 Ⓒ ii and iii                      Ⓓ i, ii and iii

24.



- i. function of the graph is  $y = -|x|$   
 ii. domain of the function is  $\mathbb{R}$   
 iii. the function is symmetric with  $y$ -axis

Which of the following is correct?

- Ⓐ i and ii                        Ⓑ i and iii  
 Ⓒ ii and iii                      Ⓓ i, ii and iii

25. If  $y = e^x$  then —

- i. the graph of  $y = e^{x^2}$  will pass through the point  $(0, 1)$   
 ii. the range of  $y = e^x - 2$  will be  $(-2, \infty)$   
 iii. the graph of  $y = e^x + 2$  will pass through the point  $(0, 3)$

Which of the following is correct?

- Ⓐ i and ii                        Ⓑ i and iii  
 Ⓒ ii and iii                      Ⓓ i, ii and iii

Answer the questions (26 & 27) on the basis of following information:

$$f(x) = 3x^3 + 3, g(x) = \sqrt[3]{\frac{x-2}{3}}$$

26. What is the domain of  $g(x)$ ?

- Ⓐ  $\mathbb{R}$                               Ⓑ  $\mathbb{R} - \left\{\frac{2}{3}\right\}$   
 Ⓒ  $\mathbb{R} - \{2\}$                       Ⓓ  $\mathbb{R} - \{0\}$

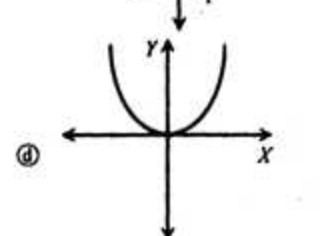
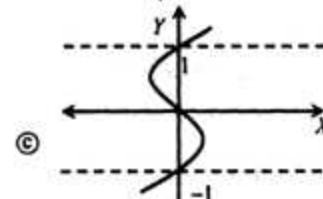
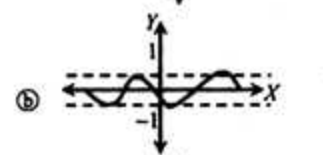
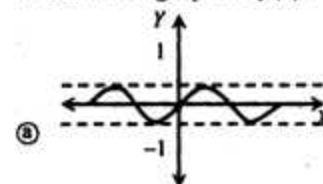
27.  $fog(3) =$  what?

- Ⓐ  $1$                                 Ⓑ  $2$   
 Ⓒ  $3$                                 Ⓓ  $4$

Answer the questions (28 & 29) on the basis of following information:

$f(x) = \sin x$  is a periodic function.

28. What is the graph of  $f(x)$ ?



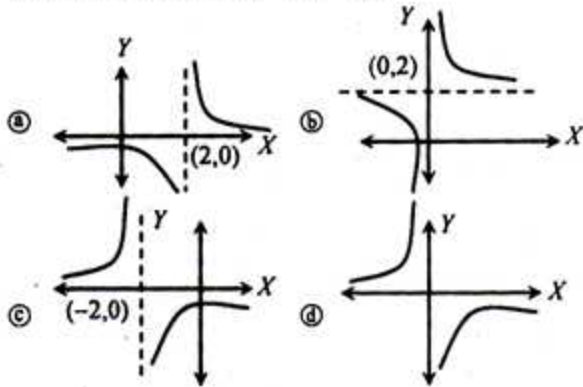
29. What is the period of  $f(x)$  ?

- Ⓐ  $2\pi$                       Ⓑ  $\pi$   
 Ⓒ  $\frac{\pi}{2}$                         Ⓓ  $\frac{\pi}{4}$

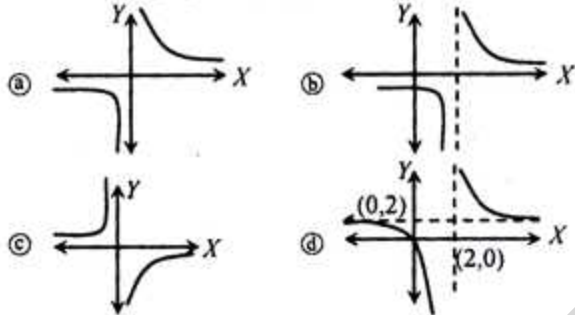
Answer the questions (30 & 31) on the basis of following information:

$f(x) = \frac{1}{x}$  is a function.

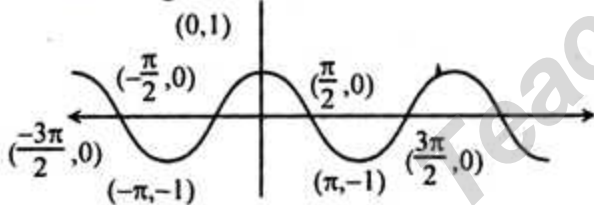
30. What is the graph of  $y = f(x-2)$  ?



31. What is the graph of  $f^{-1}(x)$  ?



Answer the questions (32 & 33) in light of the information given below:



32. Which is the equation of the above graph?

- Ⓐ  $y = \sin x$                       Ⓑ  $y = -\sin x$   
 Ⓒ  $y = \cos x$                         Ⓓ  $y = -\cos x$

33. If the function is a periodic function, what is the period?

- Ⓐ  $\pi$                                   Ⓑ  $2\pi$   
 Ⓒ  $\frac{\pi}{2}$                                 Ⓓ  $\frac{3\pi}{2}$

Answer the questions (34 & 35) in light of the information given below:

$f(x^3 - 3) = x - 2$

34.  $f(x) =$  What?

- Ⓐ  $\sqrt[3]{x-2}$                       Ⓑ  $x^3 + x - 5$   
 Ⓒ  $\sqrt[3]{x+3}$                         Ⓓ  $\sqrt[3]{x+3} - 2$

35.  $f(5) =$  what?

- Ⓐ 0                                      Ⓑ 6  
 Ⓒ  $2\sqrt{2} - 2$                       Ⓓ 1

36. The function  $f: \mathbb{R} \rightarrow \mathbb{R}$  is defined as  $f(x) = e^{x-3}$  then what is the value of  $f^{-1}(e)$ ? [DU. 15-16]

- Ⓐ 4                                      Ⓑ 3  
 Ⓒ 2                                      Ⓓ 0

37. What is the domain and range of the function  $y =$

$\frac{1}{\sqrt{4-x}}$ ? [DU. 15-16]

- Ⓐ  $-\infty < x \leq 4; 0 \leq y < \infty$   
 Ⓑ  $-\infty < x < 4; 0 < y < \infty$   
 Ⓒ  $-\infty < x < 4; 0 \leq y < \infty$   
 Ⓓ  $-\infty < x \leq 4; 0 < y < \infty$

38. What is the domain and range of the function  $f(x) =$

$\frac{1}{\sqrt{4-x^2}}$ ? [DU. 14-15]

- Ⓐ  $x < -2, y > \frac{1}{2}$                       Ⓑ  $-2 < x < 2, y \geq \frac{1}{2}$   
 Ⓒ  $-2 \leq x \leq 2, y < \frac{1}{2}$                       Ⓓ  $-x < -2 \& x > 2, -2 < y < 2$

39. The domain and range of the function  $f(x) =$

$\sqrt{x^2 - 5x + 6}$  is respectively- [DU. 13-14]

- Ⓐ  $x \leq 2, 3 \leq x$  and  $y \geq 0$                       Ⓑ  $2 \leq x \leq 3$  and  $y \geq 0$   
 Ⓒ  $x \geq 3$  and  $y > 0$                       Ⓓ  $x \leq 2, x \geq 3$  and  $y > 0$

40. If  $f(x) = (x-2)(1-x)$  then, what is the value of

$f(f(3))$ ? [DU. 13-14]

- Ⓐ 9                                      Ⓑ -12  
 Ⓒ 12                                      Ⓓ 8

41. If  $f(x) = \frac{5x+3}{4x-5}$  then  $f^{-1}(x) =$  what? [DU. 10-11]

- Ⓐ  $\frac{5x+3}{4x-5}$                       Ⓑ  $\frac{4x-5}{5x+3}$   
 Ⓒ  $\frac{5x-3}{4x-5}$                       Ⓓ  $\frac{5x+3}{4x+5}$

42. If  $f(x) = \sin x, g(x) = x^2$  then what is the value of  $f$

$\left(g\left(\frac{\sqrt{\pi}}{2}\right)\right)$ ? [DU. 09-10]

- Ⓐ  $\frac{\sqrt{2}}{2}$                                   Ⓑ  $\frac{\sqrt{3}}{2}$   
 Ⓒ  $\frac{1}{2}$                                       Ⓓ 1

43. If  $f(x) = x+1$  and  $g(x) = 2x$  then what is the value of  $(f \circ g^{-1})(2)$ ? [BUET 13-14]

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

44. If  $f(x) = x^2 - 2|x|$  and  $g(x) = x^2 + 1$  then what is the value of  $(f \circ g)(2)$ ? [BUET 12-13]

- Ⓐ 0                                      Ⓑ 5  
 Ⓒ 15                                      Ⓓ 25



