Hill Side School

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Kindergarten Division Phone 011- 645 74 44
P.O.Box 21616 Addis Ababa, Ethiopia

Hillside @ ethionet.et

Full Name _____ **Grade -11** **Section** _____ **4th Quarter Final Exam**

Subject – MATHEMATICS for SOCIAL SCIENCE **Year: 2012 E.C** ***Time allowed 2.5 hrs.***

ALL answers for ALL parts should be given on the separate answer sheet.

PART I: Choose the correct answer and write the letter of your choice in BLOCK LETTERS on the Separate answer sheet provided. (Total of 40 pts.)

1. If $x<0$, then the simplest form of the expression $\frac{x-|x|}{x}$ is equal to

(A) $2x$ **(B)** 2 **(C)** -2 **(D)** 0

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

(A) $\sqrt{x}-2$ **(B)** $\sqrt{x}+2$ **(C)** $\sqrt{x}$ **(D)** $\frac{\sqrt{x}}{x}$

3. Which one of the following is the domain of $f(x)=x-\frac{x^2+1}{x^4+x}$?

(A) $\Re/\{0\}$ **(B)** $\Re/\{-1\}$ **(C)** $\Re/\{0,1\}$ **(D)** $\Re/\{-1,0\}$

4. What are the values of a and b which make the mathematical sentence $\frac{x+1}{x^2-9}=\frac{a}{x-3}+\frac{b}{x+3}$ true for all real numbers $x\neq 3,-3$?

(A) $a=1,b=0$ **(B)** $a=\frac{1}{3},b=\frac{3}{5}$ **(C)** $a=-\frac{2}{5},b=1$ **(D)** $a=\frac{2}{3},b=\frac{1}{3}$

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

(A) $\{1,-1\}$ **(B)** $\{2\}$ **(C)** $\{-1\}$ **(D)** $\{1,2,-1\}$

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

(A) $f^{-1}(x)=\frac{e^x-2}{e^x-3}$ **(C)** $f^{-1}(x)=\frac{e^x-2}{e^x+1}$

(B) $f^{-1}(x)=\frac{e^x}{e^x+1}-2$ **(D)** $f^{-1}(x)=e^{\left(\frac{x}{x-1}\right)}-2$

7. The line ℓ passes through $(0,5)$ and $(-5,0)$. What is the measure of the angle between the y-axis and the line ℓ?

(A) $\frac{\pi}{4}$ **(B)** $\frac{\pi}{3}$ **(C)** $\frac{\pi}{2}$ **(D)** $\frac{3}{2}\pi$

8. Consider a circle whose center is on the x-axis. If a line given by $y = x$ is tangent to the circle at point $(2,2)$, what is the equation of the circle?

(A) $x^2 + y^2 = 8$ **(C)** $(x-2)^2 + y^2 = 4$

(B) $(x-4)^2 + y^2 = 8$ **(D)** $(x-1)^2 + y^2 = 5$

9. What is the vertex and the equation of the directrix, respectively, of the parabola $x + y^2 + 2y + 1 = 0$?

(A) $(0,-1), x = -\frac{1}{4}$ **(C)** $(0,-1), x = \frac{1}{4}$

(B) $(-1,0), y = -\frac{1}{4}$ **(D)** $(-1,0), y = \frac{1}{4}$

10. Let the center of an ellipse be at $(1,4)$ and two of its vertices be at $(10,4)$ and $(1,2)$. What is the equation of the ellipse?

(A) $4(x-1)^2 + 81(y-4)^2 = 324$ **(C)** $9(x-1)^2 + 4(y-4)^2 = 4$

(B) $(x-1)^2 + 9(y-4)^2 = 4$ **(D)** $2(x-1)^2 + 9(y-4)^2 = 4$

11. The equation $x^2 - 4y^2 = -1$ represents

(A) a hyperbola with one of its foci at the at the origin.

(B) a parabola with vertex at the origin.

(C) a hyperbola with vertices at $\left(-\frac{1}{2},0\right)$ and $\left(\frac{1}{2},0\right)$.

(D) a hyperbola with foci at $\left(0,-\frac{\sqrt{5}}{2}\right)$ and $\left(0,\frac{\sqrt{5}}{2}\right)$.

12. Which of the following is an asymptote to the hyperbola $4x^2 - y^2 + 2y = 5$

(A) $y = -2x + 1$ **(B)** $y = 2x - 1$ **(C)** $y = -\frac{1}{2}x + 1$ **(D)** $y = -\frac{1}{2}x - 1$

13. Let $p(x): x^2 + x > 0$. Which of the following is not equivalent to $\neg(\exists x)(x^2 + x > 0)$?

(A) $(\exists x)\neg(x^2 + x > 0)$ **(B)** $(\forall x)(x^2 + x < 0)$ **(C)** $(\exists x)(x^2 + x \le 0)$ **(D)** $(\forall x)(x^2 + x \le 0)$

14. If compound proposition $(p \wedge q) \Rightarrow (\neg s \vee r)$ is false, which of the following is true?

(A) $s \Rightarrow r$ **(B)** $\neg p \vee \neg s$ **(C)** $(p \wedge \neg q) \Rightarrow r$ **(D)** $p \wedge r$

15. The population a, b, 8, 5, 7 has a mean of 6 and variance of 2. If $a > b$, then the values of a and b respectively are

(A) 7 and 3 **(B)** 8 and 2 **(C)** 9 and 1 **(D)** 6 and 4

16. Let $A=\begin{pmatrix}-2 & 0 & x\\ 2y & x+y & -4\end{pmatrix}$ and $B=\begin{pmatrix}1 & -y\\ 0 & 3\\ 1-x & 2\end{pmatrix}$ such that $A+2B^{T}=0$. Then which one of the following is the value of y?

(A) 0 **(B)** $-\frac{13}{2}$ **(C)** -8 **(D)** any real number.

17. If $A=\begin{pmatrix}4 & -3\\ -1 & x\end{pmatrix}$ is an invertible matrix and $\left|A^{-1}\right|=1$, then what is the value of x?

(A) 1 **(B)** 7 **(C)** 11 **(D)** 17

18. What is the inverse of $A=\begin{pmatrix}5 & -4\\ 3 & -2\end{pmatrix}$?

(A) $\begin{pmatrix}1 & -2\\ \frac{3}{2} & -\frac{5}{2}\end{pmatrix}$ **(B)** $\begin{pmatrix}-1 & 2\\ -\frac{3}{2} & \frac{5}{2}\end{pmatrix}$ **(C)** $\begin{pmatrix}\frac{3}{2} & -\frac{5}{2}\\ 1 & -2\end{pmatrix}$ **(D)** $\begin{pmatrix}-1 & -2\\ -\frac{3}{2} & \frac{5}{2}\end{pmatrix}$

19. Let $A=\begin{pmatrix}1 & 1 & 1\\ 1 & \alpha & \alpha\\ 1 & \alpha & \beta\end{pmatrix}$. Which one of the following is equal to the det(A)?

(A) $(1-\alpha)(\beta-\alpha)$ **(B)** $(1-\beta)(\alpha-\beta)$ **(C)** $(1-\alpha)(\alpha-\beta)$ **(D)** $(\beta-1)(\alpha-\beta)$

20. The solution set of the system $\begin{cases}x-3y=5\\ y+z=1\\ -x+y-z=0\end{cases}$ is

(A) $\{(2,-1,2)\}$ **(B)** $\{(5,0,1)\}$ **(C)** $\{(-13,-6,7)\}$ **(D)** $\{\ \}$

21. Let A and B be 3×3 matrices such that $A=\begin{pmatrix}2 & 0 & 0\\ 1 & 5 & 0\\ 0 & -1 & \frac{1}{2}\end{pmatrix}$ and $|B|=\frac{1}{10}$. Which one of the following is equal to $\left|2AB^{T}\right|$?

(A) 1 **(B)** 4 **(C)** 100 **(D)** 400

22. Which one of the following is the simplest form of $\frac{4-3i}{3+4i}+\overline{1-2i}$?

(A) $1+i$ **(B)** $1+3i$ **(C)** $2-i$ **(D)** $1-3i$

23. In the set of complex numbers, the solution set of $x^{2}-2x+5=0$ is

(A) $\{2+4i,2-4i\}$ **(B)** $\{2+i,2-i\}$ **(C)** $\{1+2i,1-2i\}$ **(D)** ϕ

24. The value of x and y that satisfy the equation $(2x-yi)(3+i)=20i$ are

(A) $x=0,y=-20$ **(B)** $x=3,y=7$ **(C)** $x=1,y=-6$ **(D)** $x=-5,y=3$

25. For $i=\sqrt{-1}$, the simplest form of the expression $i^{99}+i^{38}+1$ is

(A) $-i$ **(B)** $-i+1$ **(C)** $-i+2$ **(D)** $-2i$

26. The polar form of $\frac{7-i}{3-4i}$ is

(A) $\sqrt{2}\left(\cos\frac{\pi}{2}+i\sin\frac{\pi}{2}\right)$ **(C)** $2\left(\cos\frac{\pi}{2}+i\sin\frac{\pi}{2}\right)$

(B) $\sqrt{2}\left(\cos\frac{\pi}{4}+i\sin\frac{\pi}{4}\right)$ **(D)** $2\left(\cos\frac{\pi}{4}+i\sin\frac{\pi}{4}\right)$

27. A three-digit library ID-card is to be printed from the numbers 0,1,2,3,4,5 and 6 in a such a way that the first is non-zero and no number is to be repeated. How many such cards can be printed?

(A) 180 **(B)** 216 **(C)** 210 **(D)**343

28. A student needs to select three books from 4 different Mathematics, 4 different Physics and one Geography book. What is the probability that one of them is Mathematics and the other two are either Physics or Geography books?

(A) $\frac{10}{21}$ **(B)** $\frac{19}{21}$ **(C)** $\frac{13}{21}$ **(D)** $\frac{17}{21}$

29. The following frequency distribution displays the age of students in a certain primary school.

AGE	**8**	**10**	**11**	**12**	**13**
NUMBER OF STUDENTS	5	15	8	10	2

Which one of the following is NOT true about the data?

(A) The median is 10.5 **(C)** The mean is 10.6

(B) The mode is 10. **(D)** The range is 5.

30. If $(\neg p\vee q)\Rightarrow(r\wedge\neg r)$ is true, then which of the following is necessarily true?

(A) $r\Rightarrow q$ **(B)** $(q\Rightarrow p)\wedge r$ **(C)** $p\wedge\neg r$ **(D)** $(q\wedge r)\Rightarrow p$

31. If the truth value of $(p\wedge\neg p)\Rightarrow\left[(q\vee\neg q)\Rightarrow r\right]$ is true, then which one of the following must be true?

(A) p **(B)** $\neg r$ **(C)** $\neg q$ **(D)** q

32. Suppose the proposition $p\Rightarrow\neg q$ is false (F), which of the following is true?

(A) $\neg q\wedge(p\Rightarrow q)$ **(B)** $\neg p\vee(q\Rightarrow\neg p)$ **(C)** $(\neg q\vee p)\Leftrightarrow q$ **(D)** $(q\vee p)\Leftrightarrow\neg p$

33. Which one of the following is NOT true about the graph of $f(x)=\frac{x^2-1}{x^2+1}$?

(A) The range of f is $(-\infty,1)$ **(C)** The line $y=1$ is a horizontal asymptote.

(B) f is an even function **(D)** As $x\to-\infty$, $f(x)\to1$

34. A group of 15 workers can accomplish a job in 28 days. At the same rate by how many workers can the same job be accomplished in 8 days less time ?

(A) 21 **(B)**18 **(C)**14 **(D)** 20

35. A 6% tax on a certain item amounts to Birr 10.20. What is the cost of the item?

(A) Birr 330.20 **(B)** Birr 61.20 **(C)** Birr 180.20 **(D)** Birr 170

36. The minimum value of the Objective function $Z = 3x + 4y$, subject to:

$$x \geq 1$$
$$y \geq 0$$
$$3x - 4y \leq 12$$
$$x + 2y \geq 4$$

(A) No minimum **(B)** 9 **(C)** 6 **(D)** 10

37. An electronics sales man has Birr 80,000 to buy television and refrigerator. Suppose the unit price of television is Birr 15,000 and the unit price of refrigerator is Birr 12,000 in a specific item model. If he has bought three televisions, what is the maximum number of refrigerator he can buy with the remaining money?

(A) 4 **(B)** 3 **(C)** 2 **(D)** 1

38. A sum of money, Birr 10,000 is deposited in an account that pays 8% annual interest compounded semi-annually. Another Birr 9,184 is deposited in the same account after exactly one year of the first deposited. How much (in Birr) is in the account after 2 years?

(A) 20,824 **(B)** 20,864 **(C)** 21,632 **(D)** 21,846

39. What is the percent markup on selling price if the mark price on cost is 25%?

(A) 25% **(B)** 20% **(C)** 15% **(D)** 30%

40. There are three children in a room with ages four, five and six. If a five-year old child enters the room, then which of the following statement is correct?

(A) The mean age will stay the same, but the standard deviation will decrease.
(B) The mean age will stay the same, but the standard deviation will increase.
(C) The mean age and the standard deviation will both increase.
(D) The mean age and the standard deviation will remain the same.

PART II: Fill in the blank spaces with a correct item that completes the sentence best.

1. The coefficient of the term x^2y^3 in the expansion of $(2x+5y)^5$ is _____.

2. The standard deviation of the dataset **20, 16, 12, 8, 18, 5, 9, 24** is _____.

3. The ratio of students to teachers in a school is 39:2. If the number of students is 819 and the number of female teachers is 25, then the number of male teachers in the school is _____.

4. The length of the major axis of the ellipse $x^2 + 9y^2 - 2x + 18y + 1 = 0$ is equal to _____.

5. If A is a square matrix of order 3 and $\det(A) = 5$, then the value of $\det(A \times \text{adj}(A))$ is _____.

PART III: Work out each of the following questions clearly and neatly. Answers without sufficient supporting work will receive no credit. (Total of 5 Point)

1. Find the values of A, B and C that make the following mathematical statement true for all $x \neq 0$.

$$\frac{x-1}{x^3+x} = \frac{A}{x} + \frac{Bx+C}{x^2+1}$$

2. Given the second-degree equation $3x^2 - 6x = y^2$.
   (a) Identify what the equation represents to.
   (b) Sketch the graph of curve.

3. An investment of Birr 3000 was made over 3 years at an interest rate of 5% with interest compounding annually. What are the **principal** at the start of the second year and the **interest** earned during the second year?

THE PLANET IS YOURS AND SO IS THE FUTURE, SO BE SAFE!

GOOD LUCK