neway challenge academy no.1

2019/20 Academic Year Revision Program Model Exam

Grade: **12** Subject: **Mathematics (Social)**

I. Choose the correct answer from the given alternatives.

1. Which one of the following functions is a one to one correspondence?
   A. f:[0,∞) → IR, defined by f(x) = |x|
   B. f:IR → [0,∞), defined by f(x) = x^2
   C. f:IR → [0,∞), defined by f(x) = 3^x
   D. f:(0,∞)→IR defined by f(x) = $\log_2 x$

2. If f(x) = $\frac{x}{2x-1}$ and g(x) = $\frac{1}{2}x+3$, then what is the domain of (fog)(x)?
   A. IR\$\left\{\frac{1}{2}\right\}$ B. IR\ {-5} C. IR\$\left\{-5,\frac{1}{2}\right\}$ D. IR\ {-6,0}

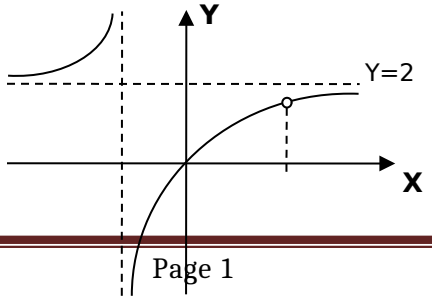
3. If f(x) = $\ln\left(\frac{x}{x-1}+2\right)$, for x > 1, then which of the following is the inverse of the function f?
   A. g(x) = $\frac{e^x-2}{e^x-3}$ B. g(x) = $\frac{e^x-2}{e^x+1}$ C. g(x) = $\frac{e^x}{e^x+1}-2$ D. g(x) = $\frac{x}{e^{x-1}}-2$

4. The respective values of A,B and C so that $\frac{x-1}{x^3+x}=\frac{A}{x}+\frac{BX+C}{x^2+1}$?
   A. -1, 1, 1 B. -1, 1, 2 C. 1, -2, 0 D. 3, 1, 2

5. What is the partial fraction decomposition of $\frac{x^2+x+1}{(x+2)(x^2+1)}$?
   A. $\frac{2}{5(x+2)}+\frac{3x+1}{5(x^2+1)}$ B. $\frac{5}{3(x+2)}+\frac{2x+1}{3(x^2+1)}$ C. $\frac{3}{5(x+2)}+\frac{2x+1}{5(x^2+1)}$ D. $\frac{2}{3(x+2)}+\frac{2x+1}{3(x^2+1)}$

6. What is the solution set of $\frac{1-\frac{1}{x}}{1-\frac{1}{x^2}}=3x^2-\frac{x}{1+\frac{1}{x}}$?
   A. $\left\{\frac{1}{3}\right\}$ B. $\left\{-1,\frac{1}{3}\right\}$ C. $\left\{\frac{-1}{3}\right\}$ D. $\left\{3,\frac{-1}{3}\right\}$

7. Which one of the following functions could most likely be drawn as the graph below?
   A. f(x) = $\frac{x}{x-2}$
   B. f(x) = $\frac{x^2+2x}{x^2-4}$



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

D. f(x) = $\frac{2x^2-4x}{x^2-4}$ X=2

8. Which of the following is NOT true about f(x) = $\frac{1-2x^2}{x^2+4}$?
   A. Range of f = {yϵIR: -2¿y ≤ 0}
   B. The graph of f has no vertical asymptote
   C. Y = -2 is a horizontal asymptote to the graph of f
   D. The graph of f is symmetric with respect to the y-axis

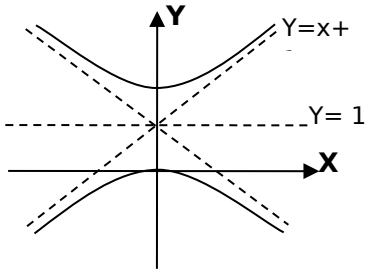
9. The tangent of the angle between the lines l_1: 3x + y – 2 = 0 and l_2: 2x – y – 5 = 0 is:
   A. $\frac{-1}{6}$ B. $\frac{-5}{6}$ C. -1 D. $\frac{-1}{5}$

10. The distance of the point P(2, -3) from the line l: 3x + 4y – 9 = 0 is:
    A. 5 B. 3 C. $\frac{3}{5}$ D. 1

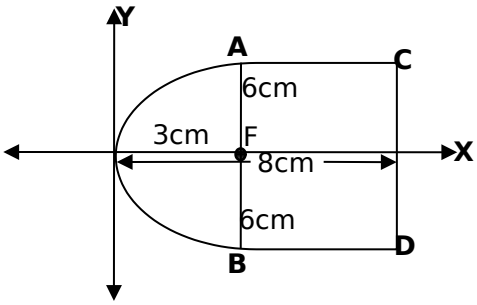
11. Which one of the following is an equation of the circle whose end points of a diameter are (0, -2) and (2, 2)
    A. $x^2 + y^2 = 4$ C. $(x – 1)^2 + (y – 0)^2 = 4$
    B. $x^2 + y^2 – 2x – 4 = 0$ D. $x^2 + y^2 – 2y – 4 = 0$

12. What is the equation of the line that passes through (1,1) and is parallel to the line 3y – x = 1?
    A. 3x – y = 2 B. x + 3y = 4 C. x – 3y + 2 = 0 D. 3y – x + 2 = 0

13. The following is the graph of a hyperbola. Its equation is:
    A. $x^2 – y^2 + 2x = 0$
    B. $y^2 – x^2 + 2y = 0$
    C. $x^2 – Y^2 – 2X = 0$
    D. $y^2 – x^2 – 2y = 0$



14. A cross-section of a parabolic reflector is shown in the figure below. The opening at the focus, AB is 12cm. what is the diameter of the opening, CD, 8cm from the vertex?
    A. $8\sqrt{6}cm$
    B. 12cm
    C. $8\sqrt{3}$
    D. $6\sqrt{8}cm$



15. What is the eccentricity of the ellipse whose equation is given by $\frac{y^2}{36}=\frac{4-x^2}{4}$?

A. $\frac{\sqrt{6}}{2}$ B. 2/3 C. $\frac{\sqrt{2}}{6}$ D. $\frac{2\sqrt{2}}{3}$

16. If x = 3, then $x^2 - 4 = 5$, then the contra positive is:
    A. If $x^2 - 4 = 5$, then x = 3
    B. If $x^2 - 4 \neq 5$ then x = 3
    C. If x = 3, then $x^2 - 4 \neq 5$
    D. If $x^2 - 4 \neq 5$, then $x \neq 3$
17. Which one of the following is equivalent to $\mathcal{T}\left[(\forall)(P(x) \Longrightarrow Q(x))\right]$?
    A. $(\forall x)(\mathcal{T}p(x) \Longrightarrow \mathcal{T}Q(x))$
    B. $(\exists x)(\mathcal{T}p(x) \Longrightarrow \mathcal{T}Q(x))$
    C. $(\exists x)(p(x) \wedge Q(x))$
    C. $(\exists x)(p(x) \wedge \mathcal{T}Q(x))$
18. Suppose the proposition $p \Longrightarrow \mathcal{T}$q is false (F), which of the following is TRUE?
    A. $\mathcal{T}$q∧(p⟹q) B. $\mathcal{T}$p∨ (q⟹$\mathcal{T}$p) C. ($\mathcal{T}$q∨p)⇔q D. (p∧q)⇔$\mathcal{T}$ p
19. In how many more ways can 6 people be arranged in a row than if they were arranged in a circle?
    A. 190 B. 120 C. 60 D. 122

20. A box contains 10 items of which 3 are defective. If 2 items randomly taken out of the box, what is the probability that both items are NOT defective?
    A. $\frac{7}{15}$ B. $\frac{7}{10}$ C. $\frac{4}{7}$ D. 0.49
21. If you pick a playing card from a pack of 52 cards, what is the probability that a picture card is drawn?
    A. $\frac{1}{13}$ B. $\frac{3}{13}$ C. $\frac{2}{13}$ D. $\frac{3}{52}$
22. The coefficient of x^2 and the constant term in the expansion of $(2x - x^{-1})^4$ respectively are:
    A. -32, -24 B. -32, 24 C. -48, 60 D. 48, -60
23. The expenditure of 100 families is given below

Expenditure	**0 – 9**	**10 – 19**	**20 – 29**	**30 – 39**	**40 – 49**
No of families	**14**	**23**	**f_1**	**21**	**f_2**

If the mode of the date is 23.5, what are the values of f_1 and f_2?
A. $f_1 = 27, f_2 = 15$ B. $f_1 = 15, f_2 = 27$ C. $f_1 = 25, f_2 = 17$ D. $f_1 = 17, f_2 = 25$

24. The following is a simple frequency distribution of a data with variable x

x	**3**	**5**	**6**	**7**
Frequency	**2**	**5**	**2**	**1**

What are the mean ($\bar{x}$) and variance δ^2 of the data?
A. $\bar{x} = 5, \delta^2 = 0.7$ C. $\bar{x} = 6, \delta^2 = 0.7$
B. $\bar{x} = 6, \delta^2 = 1.4$ D. $\bar{x} = 5, \delta^2 = 1.4$

25. A measurement is grouped into five class intervals with the following frequency distribution

Class interval	**5 – 15**	**15 – 25**	**25 – 35**	**35 – 45**	**45 – 55**
Frequency	**22**	**40**	**68**	**50**	**20**

What are the first quartile Q_1 and the 75th percentile P_{75} of the measurement?

A. $Q_1 = 20$, $P_{75} = 40$
C. $Q_1 = 20$, $P_{75} = 39$
B. $Q_1 = 22$, $P_{75} = 40$
D. $Q_1 = 22$, $P_{75} = 39$

26. If a matrix B = $\begin{pmatrix} 1 & -1 & -3 \\ 0 & 2 & -1 \\ 2 & 1 & 4 \end{pmatrix}$ and C is a 3 × 3 matrix with |C| = 5, then the det (C^tB) is equal to:

A. 135 B. 115 C. 45 D. 23

27. Which one of the following is the set of values of x so that the matrix A = $\begin{pmatrix} x & 2 & -1 \\ 1 & x-1 & 1 \\ 0 & 1 & 2 \end{pmatrix}$ is singular?

A. {1} B. {-1, 2} C. {-1, 5/2} D. {3/2, -1}

28. If matrix A = $\begin{pmatrix} 2 & 7 \\ 1 & 3 \end{pmatrix}$ and B^{-1} = $\begin{pmatrix} 1 & 1 \\ 0 & 2 \end{pmatrix}$, then $(AB)^{-1}$ is equal to:

A. $\begin{pmatrix} 4 & -3 \\ 4 & 4 \end{pmatrix}$ B. $\begin{pmatrix} -2 & 5 \\ 2 & -4 \end{pmatrix}$ C. $\begin{pmatrix} -3 & 11 \\ 1 & -3 \end{pmatrix}$ D. $\begin{pmatrix} 4 & 0 \\ 0 & 2 \end{pmatrix}$

29. Consider the following system of equations:

$$\begin{cases} ax+by=2 \\ x+3y+2Z=0 \\ 2x+y+Z=0 \end{cases}$$

If the determinant of the coefficient matrix is 2, then what is the solution set of the system?

A. {(1, 3, -5)} B. (1, 3, -5) C. {(-2, -6, 10)} D. ∅

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

A. $\sqrt{2}\left(\cos\left(\frac{\pi}{2}\right)+i\sin\left(\frac{\pi}{2}\right)\right)$ C. $2\left(\cos\frac{\pi}{4}+i\sin\frac{\pi}{4}\right)$

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

31. In the set of complex number, what is the solution set of $x^2 + 4x + 5 = 0$?

A. ∅ B. {1-2i, 1+2i} C. {-2-i, -2+i} D. {2-i,2+i}

32. Which one of the following is in an arithmetic sequence?

A. 3, 5, 7, 9, 11, … C. -3, 6, -9, 12, -15, …
B. 3, 6, 12, 24, 48, … D. 1, 3, 6, 10, 15, 21, …

33. If a ≠ 0, then the value of $\frac{\lim_{x \to a} x^2-a^2}{x^4-a^4}$ is:

A. $\frac{1}{a^2}$ B. $\frac{1}{2a^2}$ C. $\frac{1}{6a^2}$ D. 0

34. What is the value of $\lim_{x \to 0} \frac{sinxcos2x}{x^2+3x}$?

A. 1/3 B. 2/3 C. 1 D. 2

35. What is the sum of $\sum_{n=1}^{30} (-1)^n \left(\frac{1}{n}+\frac{1}{n+1}\right)$?

A. $\frac{29}{30}$ B. $\frac{-29}{30}$ C. $\frac{30}{31}$ D. $\frac{-30}{31}$

36. Which one of the following is a convergent sequence?

A. $\left\{\left(\frac{5}{3}\right)^n\right\}$ B. $\left\{\frac{n^2}{n+1}\right\}$ C. $\left\{\frac{2n}{n+1}\right\}$ D. $\left\{\frac{(-1)^n}{n+1}\right\}$

37. Which of the following is the sum of the series $5-\frac{10}{3}+\frac{20}{9}-\frac{40}{27}+\ldots?$

A. -5 B. -3 C. 3 D. 5

38. Given that $\lim_{x \to 3} f(x)= 5$ and $\lim_{x \to 3} g(x)= 11$. What is the value of the limt,

$\lim_{x \to 3} \left(\frac{(f(x)-g(x))(g(x)-2f(x))}{g(x)^2-f(x)}\right)$?

A. $\frac{-66}{96}$ B. $\frac{-1}{16}$ C. 0 D. does not exist

39. What is the left hand limit, $\lim_{x \to 0^{-}¿} \frac{|x|-xe^x}{4x}$?

A. -2 B. $\frac{-1}{2}$ C. 0 D. does not exist

40. Let f(x) = $\begin{cases} a-cosx, x \le 0 \\ 3e^x-a, x>0 \end{cases}$, for what value of "a" is f continuous function?

A. 1 B. 3/2 C. 2 D. 3

41. Which of the following is the equation of the line tangent to the graph of f(x) = $\begin{cases} x-\pi, x \le 0 \\ 1-2sinx, x>0 \end{cases}$,at $(\pi, f(\pi)¿?$

A. y = 2x - 2π + 1 B. y = 2x - 2π – 1 C. y = -2x + 2π + 1 D. y = -2x + 2π – 1

42. If g(x) = $\frac{f(x)}{x+1}+(f(x))^2, f(1)=8$ and f'(1) = 2, then g'(1) is equal to:

A. 36 B. 31 C. 25 D. 16

43. If f(x) = x^3, then $\lim_{h \to o} \frac{f(2+h)-f(2)}{h}$ is equal to:

A. 4 B. -4 C. 12 D. ∞

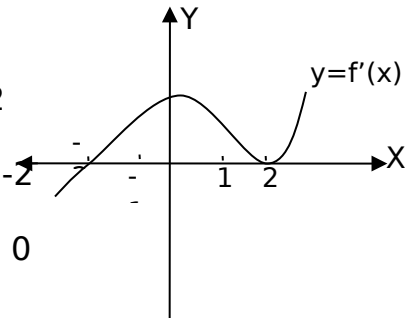
44. Suppose f(x) is differentiable on (-∞,∞) and the graph of its derivative, y = f'(x) is as shown in the following figure. Then which one of the following is TRUE about f(x)?

A. f(x) increases on $(-\infty,0) \cup (2,\infty)$

B. f(x) has local extreme value at x = 2

C. f(x) has local minimum value at x = -2

D. f(x) has local maximum value at x = 0



45. $\frac{d}{dx}\left(\ln e^{3x}\right)$ is equal to:

A. $\frac{1}{e^{3x}}$ B. $\frac{3}{e^{3x}}$ C. 3 D. 3x

46. The graph of $y = 5x^4 - x^5$ has a point of inflection at:

A. (4, 256) only B. (0, 0) only C. (3, 162) only D. (0,0) and (3, 162)

47. If $h(x) = \sqrt{1+\sqrt{x}}$, then which of the following is equal to f'(x)?

A. $\frac{1}{2\sqrt{1+\sqrt{x}}}$ B. $\frac{1}{4\sqrt{x+x\sqrt{x}}}$ C. $\frac{x}{2\sqrt{1+\sqrt{x}}}$ D. $\frac{x}{4\sqrt{x+x\sqrt{x}}}$

48. At what value of x does the function $f(x) = \frac{4x^3}{3} - x^4$ attains its maximum value?

A. -1 B. 0 C. 1 D. 4/3

49. Which one of the following is the set of critical numbers of $f(x) = \frac{3}{8}x^{\frac{8}{3}} - 6x^{\frac{2}{3}}$?

A. {-2, 2} B. {-1, 1} C. {-1, 0, 1} D. {-2, 0, 2}

50. What is the least upper bound of the sequence $\left\{(-1)^n \frac{1}{n+1}\right\}_{n=0}^{\infty}$?

A. 0 B. -1 C. -½ D. ½

51. What is $6\frac{3}{4}\%$ of 7600?

A. 520 B. 456 C. 550 D. 513

52. Let R = {(x,): $2x+y \le 14$, $3x - 2y \le 12$, $-x + 2y \le 4$, $x \ge 0$}. Which one of the following points in R?

A. (2, -3) B. (3, 4) C. (6, 2) D. (4, -1)

53. An item is sold for Birr 120 after 20% discount from its regular price. How much was the regular price of the item?

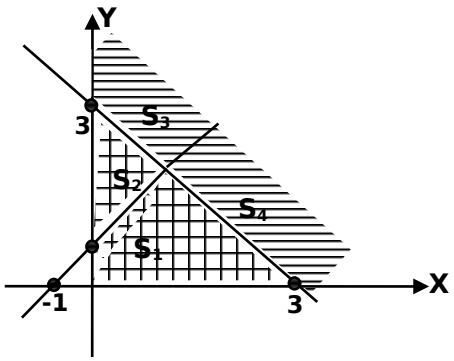
A. Birr 135 B. Birr 150 C. Birr 140 D. Birr 145

54. A jacket discounted by 20% for holyday has a price tag of Birr 576. What is the amount of discount?

A. 154 Birr B. 115.2 Birr C. 135.8 Birr D. 144 Birr

55. Which one of the regions shaded in the figure below is the solution region of the following system of inequalities?

$$\begin{cases} x+y \le 3 \\ -x+3y \ge 1 \\ x \ge 0, y \ge 0 \end{cases}$$



A. S_1

B. S_2

C. S_3

D. S_4

56. Which one of the following points is in the solution region of the linear inequalities

–x+3y ≤ 10, x+y ≤ 6, x-y ≤ 2, x≥ 0, y≥ 0?

A. (1, 1) B. (3, 4) C. (0, 4) D. (3, 0)

57. The following table presents the mean weight (in kg) of four group of students

Group	I	II	III	IV
Mean weight (in kg)	72	80	75	80
No of students in the group	10	12	8	10

What is the mean weight (in kg) of all the students?

A. 77.4 B. 76 C. 76.7 D. 77

58. What is the maximum value of

Z = 6x + 3y

Subject to :- $\begin{matrix} 2x+3y \le 18 \\ 0 \le x \le 5 \\ 0 \le y \le 5 \end{matrix}$?

A. 30 B. 38 C. 42 D. 54

59. What is the maximum value of

Z = 3x – 2y

Subject to :- $\begin{matrix} -x+y \le 0 \\ -x+2y \le 1 \\ 2x-y \le 4 \end{matrix}$?

x ≥ 0, y ≥ 0

A. 6 B. 5 C. 8 D. 10

60. Suppose the cost minimization problem results in the following constraints and objective function

minZ = 13x + 26y

Subject to :- $x+3y \geq 14$
$3x+2y \geq 14$?
$4x-y \leq 32$
$x \geq 0, y \geq 0$

then which one of the following is true?

A. The problem has no optimal solution as the feasible region is unbounded
B. The minimum cost for the problem is Z = 158
C. The optimal solution is at (x,y) = (0.7)
D. The optimal solution is at (x,y) = (2, 4)

61. If Birr 1,000 is invested at 8% compounded semi-annually what is the amount in Birr after 5 years? (You may use the information $(1.08)^5 = 1.469328$, $(1.04)^{10} = 1.48024$, $(1.02)^{20} = 1.485947$)....

A. 1,048.02 B. 1,480.24 C. 2,960.48 D. 7,401.22

62. In a company, a regular work time is 40hours per-week and the overtime payment rate is 1½ times the regular hourly rate. If an employee whose regular pay is Birr 20 per hour worked for 56 hours in a week, how much is the employee's gross payment for the week?

A. Birr 1,600 B. Birr 1, 120 C. Birr 1,280 D. Birr 960

63. The following table shows the rate of tax that should be payied from the amount of monthly salary rate that lies in the corresponding interval.

Monthly salary (in Birr)	**Tax rate**
Up to 500	Nul
501 – 1000	10%
1001 – 2500	20%
2501 – 4500	25%
Above 4500	30%

How much tax does an employee pay if his monthly salary rate is birr 3500?

A. Birr 250 B. Birr 500 C. Birr 875 D. Birr 905

64. 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 what is the number of male teachers in the school?

A. 17 B. 25 C. 32 D. 35

65. Ten different teams played football over the summer. After the summer, the top goal scorers from each team scored the following number of goals:
10 5 18 2 x 4 10 15 11 14
If the mean number of goals scored is 9, then what is the mean deviation of the data?

A. 2.4 B. 3.4 C. 4.2 D. 4.3