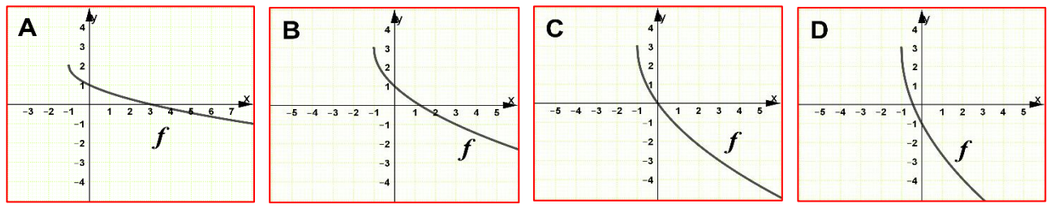
**KURDISTAN REGION GOVERNMENT -IRAQ** **IN THE NAME OF ALLAH** **Time:3.30 hours**
**MINISTRY OF EDUCATION**
**HIGH COMMITTEE OF THE GENERAL EXAMINATION**
**General Examinations for Preparatory Stage \ 1 St Attempt**
**Study year (2023-2022 )** **(Grade twelve scientific)** **Subject : Mathematics**

Fingerprint

***Choose the correct answer , two marks for each question .***

**1.** Determine the graph of the function $f(x) = 3 - 2\sqrt{x+1}$ .




**2.** Which of the following functions is symmetric with respect to the y-axis ?

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

**3.** The domain of which of the following functions is $]-\infty, 4[$ .

**A)** $f(x) = \frac{-1}{\sqrt{4+x}}$ **B)** $f(x) = -\sqrt{4-x}$ **C)** $f(x) = ln(4-x)$ **D)** $f(x) = -|4-x|$

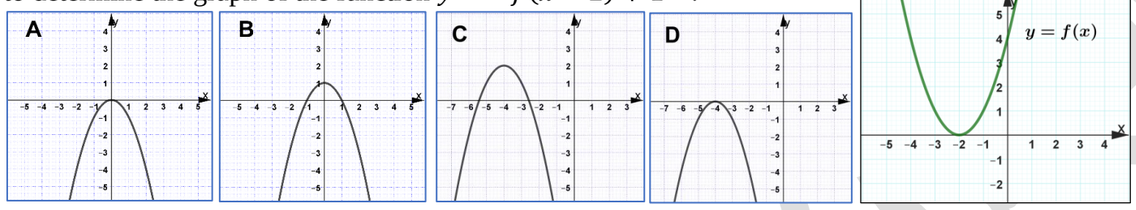
**4.** Determine the range of the function $f(x) = \begin{cases} 3-x & x < 3 \\ -\sqrt{x-3} & x \geq 3 \end{cases}$ .

**A)** $]-\infty, 0\,]$ **B)** $[\,0\,, +\infty[$ **C)** $[\,-3\,, +\infty[$ **D)** $R$

**5.** Find the equation of a horizontal line with 6 as an y-intercept .

**A)** $x = 6$ **B)** $y = 6$ **C)** $x = 0$ **D)** $y = 0$

**6.** Use the given graph of the function $y = f(x)$ on the right , to determine the graph of the function $y = -f(x-2) + 1$ .







**7.** If $f(x) = \frac{-3x^2 - bx + 5}{x+1}$ and $f(-2) = -1$ then find the value of $b$ .

**A)** $b = 1$ **B)** $b = 2$ **C)** $b = 3$ **D)** $b = 4$

**8.** A greenhouse can sell dwarf trees (6) years after they are planted. The function $h'(t) = 1.8t + 4$ models dwarf trees rate of growth in centimeter per year throughout the six years. The height of one dwarf tree was ( 10.5 *cm)* when it was planted (t = 0). What will its height be when it is one year before sold?

**A)** 69 **B)** 56.5 **C)** 53 **D)** 75.5 *(cm)*

**9.** If $f(x) = -|2x+3| + 6$ and $g(x) = 6 - x$ then find the value of $x$ where $f(x) = g(x)$ .

**A)** $x = -3$ **B)** $x = -1$ **C)** $\left.\begin{matrix} x = -3 \\ x = -1 \end{matrix}\right\}$ **D)** Has no value .

**10.** If the line passing through the points ( $3\,, b$ ) and ( $-4\,, 7$ ) and that is perpendicular to the line $2x - 3y + 8 = 0$ then what is the value of $b$.

**A)** $\frac{7}{9}$ **B)** $\frac{-7}{2}$ **C)** $\frac{35}{3}$ **D)** $\frac{-35}{3}$

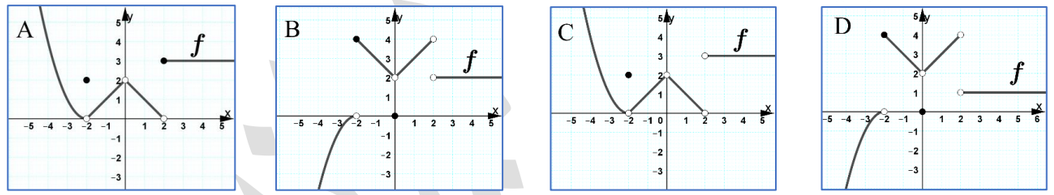
**11.** The purchase price of a new machine is 22 850 000 dinars . Its value will decrease by 900 000 dinars each year . After how many years ( $t$ ) will the price of the machine become 15 650 000 dinars after it is purchased? **A)** $t = 5$ **B)** $t = 8$ **C)** $t = 9$ **D)** $t = 12$

**12.** The result of $\lim_{x\to 3} \frac{2x-6}{\sqrt{1+x}-2}$ is : **A)** 8 **B)** 2 **C)** $\frac{1}{2}$ **D)** $\frac{1}{8}$

**13.** The result of $\lim_{x\to 4} \frac{\frac{x}{7-x} - \frac{4}{3}}{x-4}$ is: **A)** $\frac{7}{9}$ **B)** $\frac{-7}{2}$ **C)** $\frac{-7}{9}$ **D)** $\frac{-9}{7}$

**14.** Which of the following graphs satisfies these conditions :

$f(2)\ undefined$ ; $\lim_{x\to -2^-} f(x) = 0$ ; $\lim_{x\to 2^+} f(x) = 3$ ; $\lim_{x\to 0} f(x) = 2$



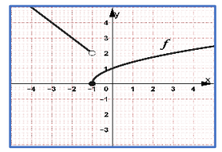

**15.** The vertical asymptotes of which of the following functions are $x = 1 + 2n$ . where $n \epsilon I$

**A)** $f(x) = \frac{1}{\cos \pi x}$ **B)** $f(x) = \tan \frac{\pi x}{2}$ **C)** $f(x) = \frac{1}{sin \pi x}$ **D)** None

**16.** Use the given graph on the right, which of the following is true ?

**A)** The domain is $R - \{-1\}$ **B)** The y-intercept is ( 1 , 0 )

**C)** The range is $R - \{2\}$ **D)** $3f(-1) - 2f(0) = -2$




**17.** Which of the following functions has a removable discontinuity at $x = 3$ and non-removable discontinuity at $x = -3$ .

**A)** $f(x) = \frac{2x+6}{x^2-9}$ **B)** $f(x) = \frac{x^2+3x}{x^2-9}$ **C)** $f(x) = \frac{x^2+8x+15}{x^2-9}$ **D)** $f(x) = \frac{x^2-x-6}{x^2-9}$

**18.** Depending on the indeterminate value theorem ( IVT ) , determine the function where the equation $f(x) = 0$ has a root between -1 and 2 .

**A)** $f(x) = 3\,x^3 - 6\,x + 5$ **B)** $f(x) = x^3 + 4\,x - 3$
**C)** $f(x) = -\,x^3 + 7\,x - 2$ **D)** Both( B and C)

**19.** Use the function $f(x) = \begin{cases} |x-3| & x < 0 \\ 6 - 3\,x & 0 \leq x < 3 \\ -(x-3)^2 & x \geq 3 \end{cases}$ , which of the following is false ?

**A)** $\lim_{x\to 2} f(x) = 0$ **B)** $\lim_{x\to 3^-} f(x) = -3$ **C)** $\lim_{x\to 0^-} f(x) = 6$ **D)** $\lim_{x\to 3^+} f(x) = 0$

**20.** Which of the following is true ? **A)** $\lim_{x\to \pi} \frac{sin\,5x}{3x} = \frac{5}{3}$ **B)** $\frac{d}{dx}\left(\frac{-3}{x^2+1}\right) = \frac{6}{(x^2+1)^2}$

**C)** $\int_0^3 (x-2)\,(3x+1)\,dx = \frac{-3}{2}$ **D)** $\lim_{x\to+\infty} \frac{(3-2\,x)^2}{2\,x^2+1} = -2$

**21.** If g and h are two differentiable function and $f(x) = \frac{g(x)}{h(x)}$ where $h(x) \neq 0$ , find the result of $f'(1)$. knowing that $g'(1) = \lim_{\Delta x\to 0} \frac{[2(1+\Delta x)-3]+1}{\Delta x}$ and the tangent line to the graph of a function h at the point ( 1 , 4 ) passes through the point ( 3 , 6 ): **A)** $\frac{7}{16}$ **B)** $\frac{9}{16}$ **C)** $-\frac{7}{16}$ **D)** $-\frac{9}{16}$

**22.** Which one is the equation of the tangent line to the graph of the function $f(x) = \sqrt{2-x}$ at $x = -2$ ?

**A)** $x + 4y = 6$ **B)** $3x - 2y = -10$ **C)** $4x - y = 6$ **D)** $x - 4y = -10$

**23.** If $f(x) = ln(\,x\sqrt{x}\,)$ , find the value of $f'(\frac{1}{2})$ . **A)** $\frac{3}{2}$ **B)** 3 **C)** 6 **D)** $-\frac{3}{2}$

**24.** Which of the following functions has no horizontal tangent line ?

**A)** $f(x) = \frac{1}{3}\,x^3 - 3\,x^2 + 9\,x$ **B)** $f(x) = x^3 - 3\,x^2 + 3\,x$
**C)** $f(x) = 2\,x^3 - 3\,x^2$ **D)** $f(x) = 2\,x^3 + x + 1$

**25.** Which of the following is false ?  **A)** $\frac{d}{dx}\left(ln\ \frac{3}{x^4}\right)=\frac{-4}{x}$  **B)** $\frac{d}{dx}\ (3-2e^{4\pi})=0$

**C)** $\frac{d}{dx}\left(sin\sqrt{x}\right)=\frac{cos\ x}{2\sqrt{x}}$  **D)** $\frac{d}{dx}\ (cos^2 x)=-sin\ 2x$

**26.** Find the result of $\lim_{x\to 0}\frac{1-\cos 4x}{1-\cos 9x}$ . ( Use L'Hôpital's rule )  **A)** $\frac{3}{8}$  **B)** $\frac{16}{81}$  **C)** $\frac{4}{9}$  **D)** $\frac{1}{2}$

**27.** If $f(x)=5-2x^2$ and $g(x)=3-x$ then find the slope of the composite function $(fog)_{(x)}$ at $x=3$.  **A)** 0  **B)** 3  **C)** 8  **D)** 5

**28.** Which of the following functions is differentiable at $x=-2$ ?

**A)** $f(x)=\begin{cases}x^2+4x+2 & x<-2\\ 1-4x-x^2 & x\geq -2\end{cases}$  **B)** $f(x)=\begin{cases}-2-x & x<-2\\ x+2 & x\geq -2\end{cases}$

**C)** $f(x)=\begin{cases}(x+2)^3 & x<-2\\ (x+2)^2 & x>-2\end{cases}$  **D)** $f(x)=\begin{cases}3-x^2 & x<-2\\ 4x+7 & x\geq -2\end{cases}$

**29.** Find the value of $x$ in the interval $[\,0\,,\pi\,]$ where the rates of change of the two functions $f(x)=\frac{1}{sin\ x}$ *and* $g(x)=\frac{1}{cos\ x}$ are equal .  **A)** $x=\frac{\pi}{4}$  **B)** $x=\frac{3\pi}{4}$  **C)** $x=\frac{\pi}{3}$  **D)** $x=\frac{5\pi}{3}$

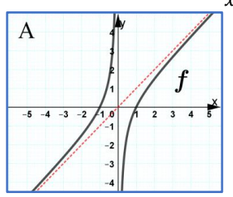
**30.** Determine when the slope of the curve $x^2+xy-y^2=1$ is defined ?
**A)** $x\neq -2y$  **B)** $x\neq 2y$  **C)** $x\neq 4y$  **D)** $x\neq -4y$

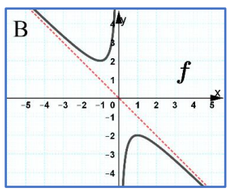
**31.** Determine the equation of the horizontal asymptote to the graph of the function $f(x)=\frac{2x^2}{x^2+1}-1$ .  **A)** $y=2$  **B)** $y=-2$  **C)** $y=1$  **D)** $y=-1$

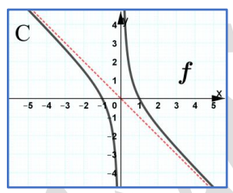
**32.** Find the interval on which the function $f(x)=x-4\sqrt{x+1}$ is decreasing ?
**A)** $]-1\,,3\,[$  **B)** $]\,3\,,+\infty[$  **C)** $]-\infty\,,3\,[$  **D)** None .

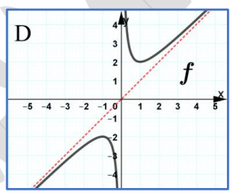
**33.** At which value of *x* does the function $f(x)=\cos\left(\frac{\pi x}{4}\right)$ have an inflection point on the interval $[\,0\,,4\,]$  **A)** $x=\frac{1}{2}$  **B)** $x=2$  **C)** $x=\frac{3}{2}$  **D)** $x=3$

**34.** Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x)=\frac{1}{x}-x$ .










**35.** Find the point of the local minimum of the function $f(x)=x^4+2x^2$ .
**A)** $(\,1\,,3\,)$  **B)** $(-1\,,3\,)$  **C)** $(\,0\,,\,0\,)$  **D)** *None*

**36.** The result of $\lim_{x\to+\infty}\frac{3x}{\cos 2x}$ is :  **A)** $\frac{3}{2}$  **B)** 0  **C)** $\frac{2}{3}$  **D)** Does not exist .

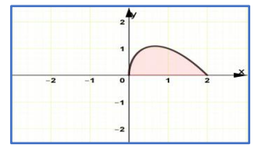
**37.** An isosceles triangle is inscribed in a circle of diameter ( 12 cm ) . Find the maximum area of this triangle.  **A)** $12\sqrt{3}\ cm^2$  **B)** $24\sqrt{3}\ cm^2$  **C)** $27\sqrt{3}\ cm^2$  **D)** $36\sqrt{3}\ cm^2$

**38.** The result of $\int\frac{x^3+1}{x^2}\,dx$ is:  **A)** $\frac{1}{2}x^2-\frac{1}{x}+c$  **B)** $\frac{1}{2}x^2+\frac{1}{x}+c$  **C)** $\frac{1}{3}x^2-\frac{1}{x}+c$  **D)** $x^2+\frac{1}{x}+c$

**39.** Find the result of $\lim_{x\to 0}\frac{tanx\ cosx}{x}$ .  **A)** 1  **B)** 0  **C)** 3  **D)** Does not exist

**40.** The result of $\int\frac{sin\ x}{\sqrt{cos\ x}}\,dx$ is :
**A)** $\frac{1}{2}\sqrt{cos\ x}+c$  **B)** $2\sqrt{cos\ x}+c$  **C)** $\frac{-1}{2}\sqrt{cos\ x}+c$  **D)** $-2\sqrt{cos\ x}+c$

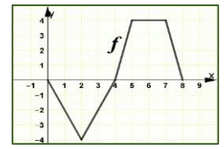
**41.** Find the area of the shaded region where $f(x)=(2-x)\sqrt{x}$
**A)** $\frac{12}{11}\sqrt{2}$  **B)** $\frac{11}{12}\sqrt{2}$
**C)** $\frac{15}{16}\sqrt{2}$  **D)** $\frac{16}{15}\sqrt{2}$



**42.** The result of $\int_1^4\frac{x-2}{\sqrt{x}}dx$ is :  **A)** $\frac{4}{3}$  **B)** $\frac{-4}{3}$  **C)** $\frac{2}{3}$  **D)** $\frac{-2}{3}$

**43.** A car was moving with a velocity of 60 m/s . The driver braked and the car stopped after 3 seconds . Assuming that the acceleration of the car was constant during the pressure period . Find the acceleration(**a**) and the distance (**s**)travelled by the car between the time the driver pressed the brakes and the stopping time .
**A)** $\begin{cases}a=-15\ m/s^2\\ s=30\ m\end{cases}$  **B)** $\begin{cases}a=-18\ m/s^2\\ s=60\ m\end{cases}$  **C)** $\begin{cases}a=-20\ m/s^2\\ s=90\ m\end{cases}$  **D)** $\begin{cases}a=-30\ m/s^2\\ s=135\ m\end{cases}$

**44.** $g$ is the function defined by $g(x)=\int_0^x f(t)\,dt$ , where $f$ is the function whose graph is shown at the right . Evaluate $g(6)$ .
**A)** 2  **B)** $-2$
**C)** $-8$  **D)** 12



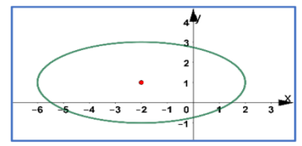

**45.** The result of $\int_1^2 ln\ 2x\ dx$ is:  **A)** $6\ ln\ 2-5$  **B)** $5\ ln\ 2-3$  **C)** $4\ ln\ 2-1$  **D)** $3\ ln\ 2-1$

**46.** Find the volume of the solid formed by revolving the region bounded by the graph of the functions $y=3-x^2$ and $y=2$ , around the x-axis .  **A)** $\frac{32\pi}{5}$  **B)** $\frac{2\pi}{3}$  **C)** $\frac{32\pi}{3}$  **D)** $\frac{64\pi}{3}$

**47.** Find the equation of the parabola with focus $F(\,2\,,2\,)$ and directrix $x=-2$ .
**A)** $(y+2)^2=8x$  **B)** $(y-2)^2=8x$  **C)** $(x+2)^2=8y$  **D)** $(x-2)^2=8y$

**48.** Which of the following is the equation of an asymptote of the graph of the hyperbola $9(x+5)^2-4(y-3)^2=-36$ ?  **A)** $y-3=\frac{3}{2}(x+5)$  **B)** $y-3=\frac{2}{3}(x+5)$
**C)** $y-3=\frac{4}{9}(x+5)$  **D)** $y-3=\frac{9}{4}(x+5)$

**49.** Find the length of the major axis of the ellipse on the right
**A)** 12  **B)** 8
**C)** 4  **D)** 16



**50.** Find the eccentricity of the hyperbola $4(y-1)^2-x^2=1$ .
**A)** $e=\frac{5}{2}$  **B)** $e=\frac{\sqrt{5}}{2}$  **C)** $e=5$  **D)** $e=\sqrt{5}$