1) If $f(x) = \log_{1/3}(1 - x)$, then $f^{-1}(-1)$ is equal to

A) -2

B) 2

C) 0

D) $\frac{2}{3}$

E) $-\frac{2}{3}$

2) The graph of $f(x) = 1 - 2^{x+1}$ is below the x-axis on the interval

A) $(-1, \infty)$

B) $(1, \infty)$

C) $(-\infty, \infty)$

D) $(-\infty, -1)$

E) $(-\infty, 1)$

3) If the adjacent figure represents the graph of the function $f(x) = \log_b(a - x)$, then $a + b =$

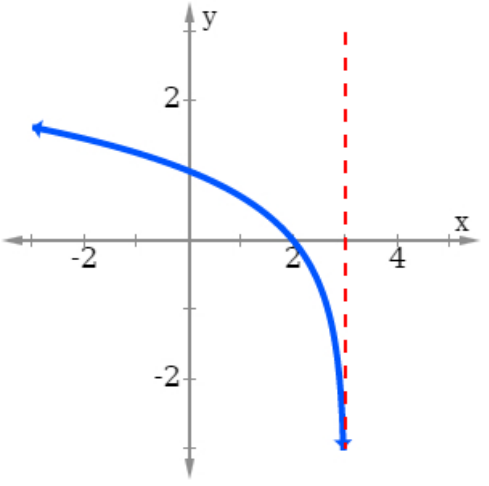
A) 6

B) 4

C) 3

D) 0

E) 9



4) If $\frac{1}{x}\log_2(e) = y$, then $\ln 8 =$

A) $\frac{3}{xy}$

B) $\frac{3y}{x}$

C) $\frac{3x}{y}$

D) $\frac{x}{3y}$

E) $3xy$

5) If $\frac{8^x + 8^{-x}}{8^x - 8^{-x}} = 3$, then $x =$

A) $\frac{1}{6}$

B) $\ln 6$

C) $\ln 2$

D) 1

E) -1

6) Which one of the following angles is NOT coterminal with 361° ?

A) -721°

B) -359°

C) 1°

D) -1079°

E) 1081°

7) A 20 ft ladder leans against a building so that the angle between the ground and the ladder is α. If $\tan\alpha = \frac{1}{2}$, how high does the top of the ladder reach on the building ?

A) $4\sqrt{5}$

B) 10

C) 4

D) $8\sqrt{5}$

E) 8

8) If the equation of the terminal side of an angle θ in standard position is $4x + 3y = 0$, where $x < 0$, then $\csc\theta + \sec\theta$ =

A) $-\frac{5}{12}$

B) $\frac{5}{12}$

C) $-\frac{7}{12}$

D) $\frac{7}{5}$

E) $-\frac{1}{5}$

9) If the adjacent figure represents the graph of $y = a\cos(bx) + 1$, then $2b - \pi a =$

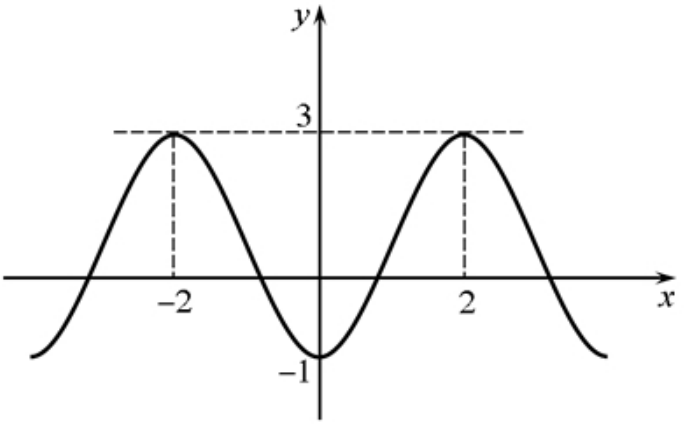
A) 3π

B) 2π

C) -2π

D) -3π

E) π



10) The graph of the function $f(x) = 2\sin(4x + \pi)$, where $-\frac{\pi}{4} \le x \le \frac{\pi}{4}$,

A) has three x-intercepts

B) has no y-intercept

C) is increasing on the interval $(-\frac{\pi}{8}, \frac{\pi}{8})$

D) is below the x-axis in the interval $(-\frac{\pi}{4}, 0)$

E) is above the x-axis in the interval $(0, \frac{\pi}{4})$

11) $\cot\left[\,2\cos^{-1}\left(-\frac{4}{5}\right)\right] =$

A) $-\frac{7}{24}$

B) $\frac{24}{7}$

C) $\frac{5}{6}$

D) $-\frac{5}{12}$

E) $-\frac{7}{12}$

12) Th expression $\frac{\tan^2 x}{1 + \sec x}$ is identical to

A) $\frac{1 - \cos x}{\cos x}$

B) $\frac{1 - \cos x}{\sin x}$

C) $\frac{1 - \sin x}{\sin x}$

D) $\frac{1 + \cos x}{\cos x}$

E) $\frac{1 + \sin x}{\sin x}$

13) If $\tan\alpha = \frac{3}{2}$ and $\tan\beta = -2$, then $\cot\left(\frac{\pi}{2} - \alpha + \beta\right) =$

A) $-\frac{7}{4}$

B) $-\frac{1}{8}$

C) $-\frac{4}{7}$

D) -8

E) -2

14) $\frac{\tan\theta + \cot\theta}{\tan\theta - \cot\theta} =$

A) $-\sec 2\theta$

B) $-\csc 2\theta$

C) $\csc 2\theta$

D) $\cos 2\theta$

E) $\sec 2\theta$

15) If $0^\circ \le x < 360^\circ$, then the number of solutions of the equation $4 \sin x \cos x + 5 \cos x = 0$, is equal to

A) 2

B) 1

C) 4

D) 0

E) 3

16) The sum of solutions of the equation $2 \tan x = \sec^2 x$ in the interval $[0, 2\pi)$ is equal to

A) $\frac{3\pi}{2}$

B) $\frac{\pi}{4}$

C) 5π

D) π

E) $\frac{3\pi}{4}$

17) If the vectors $u = \langle \sin 20^\circ, \cos 20^\circ \rangle$ and $v = \langle \cos 80^\circ, -\sin 80^\circ \rangle$, then $u \cdot v =$

A) $-\frac{\sqrt{3}}{2}$

B) $-\frac{1}{2}$

C) $\frac{1}{2}$

D) $\cos 100^\circ$

E) $-\sin 100^\circ$

18) If α is the smallest positive angle between the vectors $u = -i + 5j$ and $v = 4i + 6j$, then $\alpha =$

A) 45°

B) 60°

C) 135°

D) 120°

E) 30°

19) If the system of linear equations $\begin{cases} x - 6y = 2 \\ kx + 3y = 4 \end{cases}$ is inconsistent, then

A) $k = -\frac{1}{2}$

B) $k = -2$

C) $k < -2$

D) $k = 2$

E) $k > \frac{1}{2}$

20) If (p, q) is the solution of the system $\begin{cases} \frac{3}{4}x + \frac{1}{2}y = 5 \\ \frac{1}{4}x - \frac{3}{2}y = 1 \end{cases}$, then $p - q =$

A) 6

B) $\frac{34}{5}$

C) $-\frac{32}{5}$

D) 8

E) -8

21) The number of solutions of the system of nonlinear equations

$$\begin{cases} 2x^2 - y^2 = 4 \\ x - |y| = 0 \end{cases}$$, is

A) 2

B) 3

C) 0

D) 1

E) 4

22) If (m, n) and (p, q) are the solutions of the system $\begin{cases} x - y = 4 \\ xy = 12 \end{cases}$, then

$m + n + p + q =$

A) 0

B) - 8

C) - 16

D) - 10

E) - 6

23) If (u, v, w) is the solution of the system $\begin{cases} x - z = -3 \\ y + z = 9 \\ x + z = 7 \end{cases}$, then $uvw =$

A) 40

B) 20

C) 11

D) 21

E) 13

24) The linear system whose augmented matrix is $\left[\begin{array}{ccc|c} 1 & -3 & 4 & 1 \\ 2 & -5 & 3 & 6 \\ 1 & -2 & -1 & 5 \end{array}\right]$, has

A) infinitely many solutions

B) no solution

C) one solution (1 , 2 , 1)

D) one solution (1, - 2, - 1)

E) one solution (1 , 6 , 5)

25) Let A be a (3×4) matrix and B be a (4×3) matrix. Then which one of the following expressions is possible to find ?

A) $A(BA)$

B) $A + B$

C) B^{-1}

D) A^{-1}

E) $A(AB)$

26) If $\begin{bmatrix} w+2 & 3z+1 & 5x \\ 8y & 0 & 3 \end{bmatrix} + \begin{bmatrix} 3w & 2z & 5x \\ 2y & 5 & 6 \end{bmatrix} = \begin{bmatrix} 10 & -14 & 80 \\ 10 & 5 & 9 \end{bmatrix}$,

then $w + x + y + z =$

A) 8

B) 1

C) - 3

D) 14

E) - 9

27) If $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$, then the sum of the elements in the first column of A^{-1} is equal to

A) 5

B) 1

C) -2

D) 0

E) 3

28) If $A = \begin{bmatrix} 2 & -5 \\ 3 & -6 \end{bmatrix}$, $B = \begin{bmatrix} 15 \\ 36 \end{bmatrix}$ and $X = \begin{bmatrix} x \\ y \end{bmatrix}$, then the matrix solution of the system $AX = B$, is given by

A) $X = \begin{bmatrix} -6 & 5 \\ -3 & 2 \end{bmatrix} \begin{bmatrix} 5 \\ 12 \end{bmatrix}$

B) $X = \begin{bmatrix} -6 & 5 \\ -3 & 2 \end{bmatrix} \begin{bmatrix} -5 \\ -12 \end{bmatrix}$

C) $X = \begin{bmatrix} 2 & -5/3 \\ 1 & -2/3 \end{bmatrix} \begin{bmatrix} 15 \\ 36 \end{bmatrix}$

D) $X = \begin{bmatrix} 2 & 5/3 \\ -1 & -2/3 \end{bmatrix} \begin{bmatrix} 15 \\ 36 \end{bmatrix}$

E) $X = \begin{bmatrix} -2 & 5/3 \\ 1 & -2/3 \end{bmatrix} \begin{bmatrix} 15 \\ 36 \end{bmatrix}$

29) The sum of all solutions of $\begin{vmatrix} -x & 1 & x \\ 2 & 0 & 1 \\ 0 & 2 & x \end{vmatrix} = x^2$, is

A) 4

B) -4

C) 5

D) -5

E) 0

30) Given the matrix $\begin{bmatrix} -1 & x & x \\ -i & 2 & 1 \\ x & -x & i \end{bmatrix}$, where $i = \sqrt{-1}$. If the minor $M_{12} = 0$, then $x =$

A) 1

B) 0

C) -1

D) 2

E) -2

31) The equation of the directrix of the parabola with vertex $(1, -2)$ that has a vertical axis and passes through the point $(5, 0)$, is

A) $y = -4$

B) $y = -2$

C) $y = -1$

D) $x = -1$

E) $x = 3$

32) The focus of the parabola $y^2 + 4y + 16x - 12 = 0$, is

A) $(-3, -2)$

B) $(-2, -5)$

C) $(-2, -3)$

D) $(1, -2)$

E) $(-5, -2)$

33) The eccentricity of the ellipse $8(x - 3)^2 + (y + 1)^2 = 2$, is

A) $\frac{\sqrt{14}}{4}$

B) $\frac{\sqrt{7}}{2}$

C) $\frac{\sqrt{7}}{4}$

D) $\frac{\sqrt{14}}{2}$

E) $\frac{\sqrt{18}}{4}$

34) The length of the minor axis of an ellipse that passes through the point $(1, - 1)$ and has vertices at $(- 2, 3)$ and $(- 2, - 5)$, is

A) 6

B) 8

C) 3

D) 4

E) 10

35) The equation of one of the asymptote of the hyperbola with vertices at $(\pm 2, 0)$ and eccentricity $e = 2$, is

A) $y = -\sqrt{3}x$

B) $y = \frac{\sqrt{3}}{3}x$

C) $y = -\frac{\sqrt{3}}{2}x$

D) $y = \frac{2\sqrt{3}}{3}x$

E) $y = -\frac{1}{2}x$

36) The equation of the hyperbola with center $(1, -2)$, one focus at $(-2, -2)$ and one vertex at $(-1, -2)$, is

A) $5(x-1)^2 - 4(y+2)^2 = 20$

B) $4(y+2)^2 - 5(x-1)^2 = 20$

C) $4(y-2)^2 - 5(x+1)^2 = 20$

D) $4(x-1)^2 - 5(y+2)^2 = 20$

E) $5(x+1)^2 - 4(y-2)^2 = 20$