

QU-Placer Math Sample Test No. 2

Section 1: Elementary Algebra

Answer the following questions:

1. From the set $\{-12, -\frac{11}{2}, -\sqrt{13}, -2.2, 0, \sqrt{2}, \frac{8}{3}, 10.8472\}$ list all the elements that are rational numbers
 (A) $\{-12, -\frac{11}{2}, -2.2, 0, \frac{8}{3}, 10.8472\}$
 (B) $\{-12, -\frac{11}{2}, -2.2, \frac{8}{3}, 10.8472\}$
 (C) $\{-\frac{11}{2}, \frac{8}{3}, 10.8472\}$
 (D) $\{-\frac{11}{2}, \frac{8}{3}\}$

2. In the set $A = \{-9, -\frac{7}{2}, -2.7, -\sqrt{5}, -1, 0, 3, \frac{10}{3}, 5.87, 8\}$ which elements are integers?
 (A) $\{3, 8\}$
 (B) $\{0, 3, 8\}$
 (C) $\{-9, -1, 0, 3, 8\}$
 (D) $\{-9, -\frac{7}{2}, -2.7, -\sqrt{5}, -1, 0, 3, \frac{10}{3}, 5.87, 8\}$

3. Evaluate the expression $5\left(1 - \frac{1}{5}\right) - 2\left(2 - \frac{1}{2}\right)$
 (A) 2
 (B) -2
 (C) 1
 (D) -1

4. Evaluate $|-6 - 2| - |1 - 12|$
 (A) -7
 (B) -5
 (C) -3
 (D) -1

5. Which of the following is equal to the expression

$$\frac{3x}{(x-1)^2} - \frac{2}{(x+2)(x-1)} \quad x \neq 1, x \neq -2$$
 (A) $\frac{3x-2}{(x-1)^2(x+2)}$
 (B) $\frac{3x^2+4x-2}{(x-1)^2(x+2)}$
 (C) $\frac{3x^2+4x+2}{(x-1)^2(x+2)}$
 (D) $\frac{3x^3+x^2+4x-2}{(x-1)^3(x+2)}$

6. Evaluate $-2^3 + \frac{1}{3^{-2}}$

- (A) 0
- (B) 1
- (C) 3
- (D) $-\frac{37}{6}$

7. Simplify $3(5x - y) - 2(x - y)$

- (A) $13x - 5y$
- (B) $13x - 4y$
- (C) $13x - 2y$
- (D) $13x - y$

8. Find the value of the expression $\frac{2x+3y}{y-x}$ when $x = 2$ and $y = -3$

- (A) -1
- (B) 0
- (C) 1
- (D) 2

9. The inequality $x \geq -1$ can be expressed as

- (A) $(-1, \infty)$
- (B) $[-1, \infty)$
- (C) $(-\infty, -1)$
- (D) $(-\infty, -1]$

10. One of the factors of $8x^3 + 27$ is

- (A) $(4x^2 + 6x - 9)$
- (B) $(4x^2 + 6x + 9)$
- (C) $(4x^2 - 6x - 9)$
- (D) $(4x^2 - 6x + 9)$

11. Factor completely the expression: $2(x - 1)(x + 2) + 4(x - 1)(x - 2)$

- (A) $2(x - 1)(3x - 2)$
- (B) $2(x - 1)(3x + 2)$
- (C) $6(x - 1)(x - 2)$
- (D) $6(x - 1)(x + 2)$

12. Factor completely the expression $4 - 36m^2$

- (A) $(2 - 6m)(2 + 6m)$
- (B) $(2 - 6m)^2$
- (C) $4(1 - 3m)^2$
- (D) $4(1 - 3m)(1 + 3m)$

13. Which of the following values should be excluded from the domain of $\frac{x+5}{x^4-81x^2}$

- (A) $x = 0, x = 9$
- (B) $x = 0, x = -9$
- (C) $x = 0, x = 9, x = -9$
- (D) $x = 0, x = 9, x = -9, x = -5$

14. Perform the operation $\frac{x-1}{x^2+4x+3} \div \frac{x^2+x-2}{x^2+3x+2}$

- (A) $\frac{(x-3)(x+1)^2}{(x-1)^2}$
 (B) $\frac{(x-1)^2}{(x-3)(x+1)^2}$
 (C) $\frac{1}{x^2+3}$
 (D) $\frac{1}{x+3}$

15. The domain of the expression $\frac{2x-1}{x^2-4}$ is:

- (A) $\{x|x \neq 4\}$
 (B) $\{x|x \neq -4\}$
 (C) $\{x|x \neq -4, 4\}$
 (D) $\{x|x \neq -2, 2\}$

16. The least common multiple (LCM) of $24x^2$ and $8x^2 - 16x$ is _____.

- (A) $8x$
 (B) $8x(x-2)$
 (C) $24x^2(x-2)$
 (D) $24x^2(8x^2-16x)$

17. Rationalize the denominator $\frac{2}{5-\sqrt{2}}$

- (A) $\frac{10-2\sqrt{2}}{23}$
 (B) $\frac{10-2\sqrt{2}}{3}$
 (C) $\frac{10+2\sqrt{2}}{3}$
 (D) $\frac{10+2\sqrt{2}}{23}$

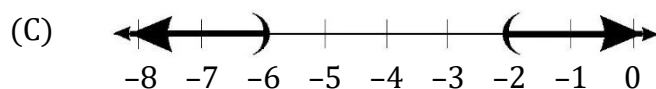
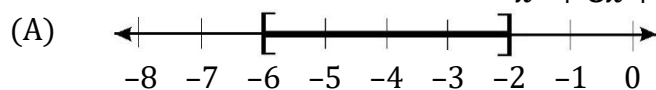
18. Simplify $\sqrt[3]{54x^3y^2} - 3x\sqrt[3]{16y^2}$

- (A) $-3x\sqrt[3]{54x^3y^2-16y^2}$
 (B) $(1-3x)\sqrt[3]{54x^3y^2-16y^2}$
 (C) $-2x\sqrt[3]{38y^2}$
 (D) $-3x\sqrt[3]{2y^2}$

19. The solution set of the equation $\sqrt{(x+3)^2} - x = 3$ is:

- (A) $(-3, \infty)$
 (B) $[-3, \infty)$
 (C) $(-\infty, -3]$
 (D) $(-\infty, \infty)$

20. Which of the following is the graph of the solution set for the inequality $x^2 + 8x + 12 \geq 0$?



21. Solve the rational Inequality $\frac{(1-x)(x-3)}{(x-2)^2} \leq 0$

- (A) $[1, 2) \cup (2, 3]$
 (B) $[1, 3]$
 (C) $(-\infty, 1) \cup (3, \infty)$
 (D) $(-\infty, 1] \cup [3, \infty)$

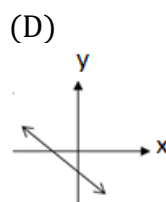
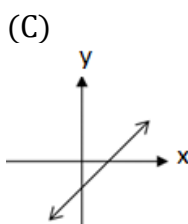
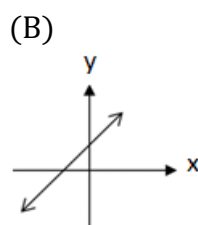
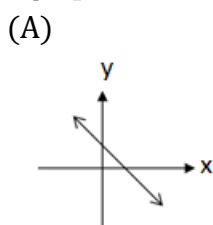
22. The solution of the equation $\frac{x+2}{x-2} = \frac{x+3}{x-3}$ is _____.

- (A) 3
 (B) 2
 (C) 1
 (D) 0

23. If $-5 \leq x \leq -1$ find a and b such that $a \leq \frac{1-x}{2} \leq b$

- (A) $a = 1, b = 3$
 (B) $a = -1, b = 3$
 (C) $a = -3, b = 1$
 (D) $a = -3, b = -1$

24. The graph that best represents $3x + 2y = 4$ is _____.



25. Determine the equation of the line that passes through the points $(-\frac{1}{2}, 0)$ and $(0, -1)$.

- (A) $y = -2x - 1$
(B) $y = -2x + 1$
(C) $y = 2x - 1$
(D) $y = 2x + 1$

26. For which value(s) of b does the equation $x^2 + bx + 9 = 0$ have one solution?

- (A) $b = 0$
(B) $b = 6$
(C) $b = -6$
(D) $b = -6$ or $b = 6$

27. Multiply $(x^2 + 4)(x + 2)(x - 2)$

- (A) $(x^4 - 16)$
(B) $(x^4 + 16)$
(C) $(x^4 + 4x^2 + 4)$
(D) $(x^4 - 4x^2 - 4)$

28. Solve $\frac{1}{x^2-x} = \frac{1}{x^2-4x}$

- (A) $x = -3$
(B) $x = 3$
(C) $x = 0$
(D) The equation has no solutions

29. If the line $y = mx + b$ passes through the point $(-2, -3)$ then _____.

- (A) $b = -3 - 2m$
(B) $b = -3 + 2m$
(C) $b = -2 - 3m$
(D) $b = -2 + 3m$

30. The equation $|x - 1| = x - 2$

- (A) has no solutions
(B) has exactly one solution
(C) has exactly 2 solutions
(D) has infinitely many solutions

Section 2: Pre-Calculus

Answer the following questions:

31. If $f(x) = \frac{1}{x}$ then $\frac{f(x+h)-f(x)}{h} =$

- (A) $\frac{1}{x(x+h)}$
(B) $-\frac{1}{x(x+h)}$
(C) $\frac{1}{h}$
(D) $\frac{h-2}{xh(x+h)}$

32. If $f(x) = x^2 - x$ then $\frac{f(a)-f(2)}{a-2} =$

- (A) $a^2 - 2$
(B) $a^2 - 1$
(C) $a + 1$
(D) $a + 2$

33. The annual profit for a company that manufactures cell phone accessories can be modeled by the function $P(x) = -0.0001x^2 + 70x + 12,500$ where x is the number of unites sold and P is the total profit in Qatari Riyals. The sales level that maximizes the company's annual profit is _____.

- (A) 12,500
- (B) 25,000
- (C) 350,000
- (D) 700,000

34. The domain of $f(x) = \begin{cases} -x^2 & x \leq -1 \\ 2 & -1 < x \leq 1 \\ \sqrt{x} & x > 1 \end{cases}$

- (A) $[0, \infty)$
- (B) $(-\infty, \infty)$
- (C) $(-\infty, -1] \cup [1, \infty)$
- (D) $(-\infty, -1] \cup (1, \infty)$

35. If $f(x) = \frac{x+2}{x}$ and $g(x) = \frac{x+2}{x^2}$ then the domain of $\frac{f(x)}{g(x)}$ is _____.

- (A) $\{x: x \neq 0\}$
- (B) $\{x: x \neq -2\}$
- (C) $(-\infty, \infty)$
- (D) $\{x: x \neq 0, -2\}$

36. The vertex of $f(x) = -3x^2 + 6x + 2$ is at the point _____.

- (A) $(-1, -7)$
- (B) $(2, 2)$
- (C) $(1, 5)$
- (D) $(0, 2)$

37. The average rate of the function $f(x) = \frac{2x}{x^2+1}$ from 1 to 3 is _____.

- (A) $\frac{2}{5}$
- (B) $\frac{1}{5}$
- (C) $-\frac{1}{5}$
- (D) $-\frac{2}{5}$

38. Given $f(x) = \frac{3x-1}{x+2}$ and its inverse $f^{-1}(x) = \frac{2x+1}{3-x}$ then the range of $f^{-1}(x)$ is _____.

- (A) $(-\infty, -3) \cup (-3, \infty)$
- (B) $(-\infty, -2) \cup (-2, \infty)$
- (C) $(-\infty, -3) \cup (-2, \infty)$
- (D) $(-2, -3)$

39. Given $f(x) = |1 - x| + 2x + 1$ can be written as _____.

- (A) $f(x) = \begin{cases} 3x & x \leq 0 \\ x+2 & x > 0 \end{cases}$
- (B) $f(x) = \begin{cases} 3x & x \leq 1 \\ x+2 & x > 1 \end{cases}$
- (C) $f(x) = \begin{cases} x+2 & x \leq 0 \\ 3x & x > 0 \end{cases}$
- (D) $f(x) = \begin{cases} x+2 & x \leq 1 \\ 3x & x > 1 \end{cases}$

40. The graph of a function f contains the point $A(a, b)$. Which of the following points is contained in the graph of $(x) = f(-x) + 1$.

- (A) $(-a + 1, b)$
- (B) $(a + 1, b)$
- (C) $(a, -b + 1)$
- (D) $(-a, b + 1)$

41. Suppose that a given function $f(x)$ intercepts with x-axis at -1 and 2 then the x intercepts of the graph of $y = -3f(x - 2)$ are _____.

- (A) -12 and -3
- (B) -3 and 0
- (C) 1 and 4
- (D) -1 and -4

42. Functions $f(x) = -x^2 + 3x$ and $g(x) = 4x - 2$ intersects at $x =$ _____.

- (A) $-2, 1$
- (B) $-3, 2$
- (C) $2, -1$
- (D) $0, 2$

43. The parabola $y = 2(x - 1)^2 - 3$ has a vertex at _____.

- (A) $(-1, -3)$
- (B) $(1, -3)$
- (C) $(2, -3)$
- (D) $(-2, -3)$

44. The equation of axis of symmetry of $f(x) = -x^2 + 4x - 3$

- (A) $x = -2$
- (B) $x = -\frac{3}{4}$
- (C) $x = \frac{3}{4}$
- (D) $x = 2$

45. The domain of $f(x) = \sqrt{1+x} - \sqrt{1-x}$ is _____.

- (A) $(-1, 1)$
- (B) $[-1, 1]$
- (C) $(0, \infty)$
- (D) $[0, \infty)$

46. If $7^{-2x} = 3$ then $49^{2x+1} =$

- (A) -42
- (B) 7
- (C) $\frac{49}{21}$
- (D) None of the above

47. The domain of the function $f(x) = \frac{1}{3} 2^{-x}$

- (A) $(-\infty, 0)$
- (B) $(0, +\infty)$
- (C) $(-\infty, +\infty)$
- (D) $(3, \infty)$

48. The range of $f(x) = 2^{-x+1} + 2$

- (A) $(-\infty, 0)$
(B) $(-\infty, 2)$
(C) $(0, \infty)$
(D) $(2, \infty)$

49. If $a = 5^b + 1$ then _____.

- (A) $b = \log_5(a) - 1$
(B) $b = \log_5(a - 1)$
(C) $b = \log_a(5) - 1$
(D) $b = (a - 1)^{\frac{1}{5}}$

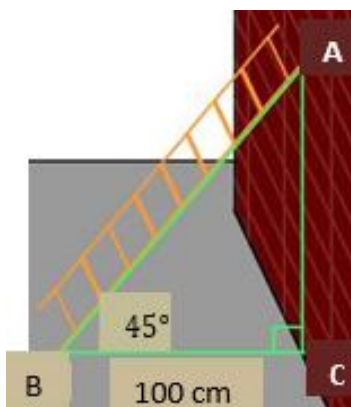
50. The domain of $f(x) = \ln(1 - x^2)$ is _____.

- (A) $(-1, \infty) \cup (-1, 1) \cup (1, \infty)$
(B) $(-1, \infty) \cup (1, \infty)$
(C) $(-1, 1)$
(D) $(0, \infty)$

51. If the $\sin \theta = a$ and $\cos \theta = b$ where a and b are positive then $\sec(\pi + \theta)$

- (A) $-\frac{1}{b}$
(B) $-\frac{1}{a}$
(C) $\frac{1}{a}$
(D) $\frac{1}{b}$

52. A ladder leans on a wall and makes an angle of 45° with the ground. The distance from the ladder to the wall on the ground is 100 cm.



The length of the ladder is: _____.

- (A) $50\sqrt{2} \text{ cm}$
(B) $100\sqrt{2} \text{ cm}$
(C) $200\sqrt{2} \text{ cm}$
(D) None of the above

53. The period of the function $y = -3 \cos\left(\frac{\pi}{2}x\right)$ is _____.

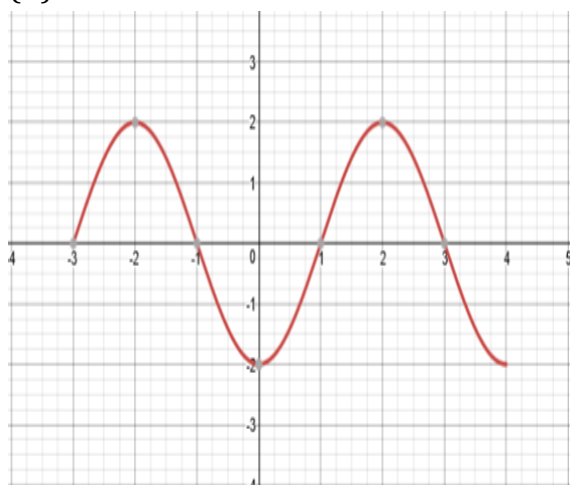
- (A) $\frac{1}{3}$
 (B) $\frac{1}{4}$
 (C) $\frac{4}{3}$
 (D) $\frac{4}{4}$

54. The range of the function $y = -2 \cos(3x) + 1$ is _____.

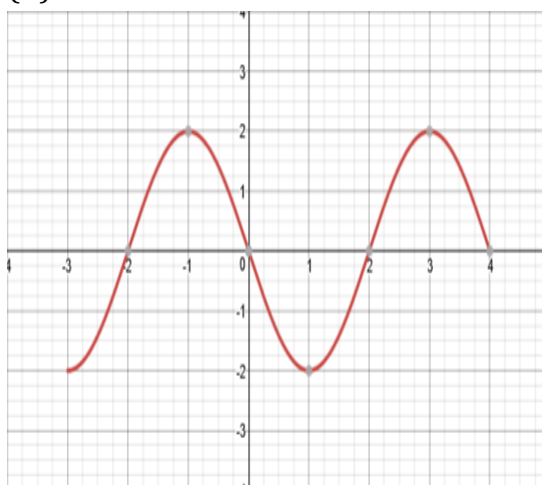
- (A) $[-3, -1]$
 (B) $[-2, 2]$
 (C) $[-1, 1]$
 (D) $[-1, 3]$

55. The graph of $y = -2 \sin\left(\left(\frac{\pi}{2}\right)x\right)$ is

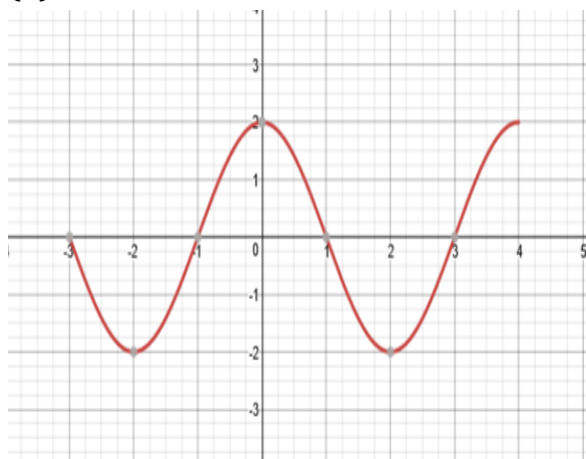
(A)



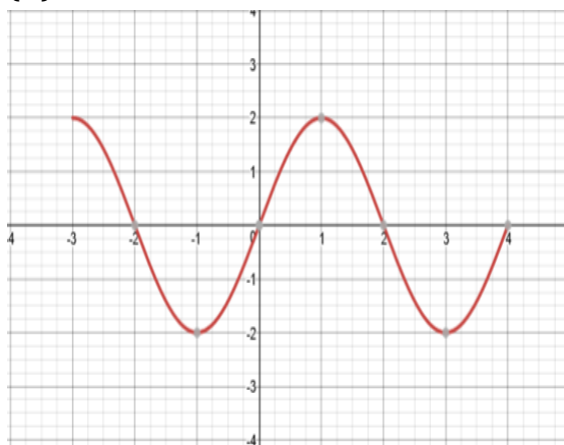
(B)



(C)



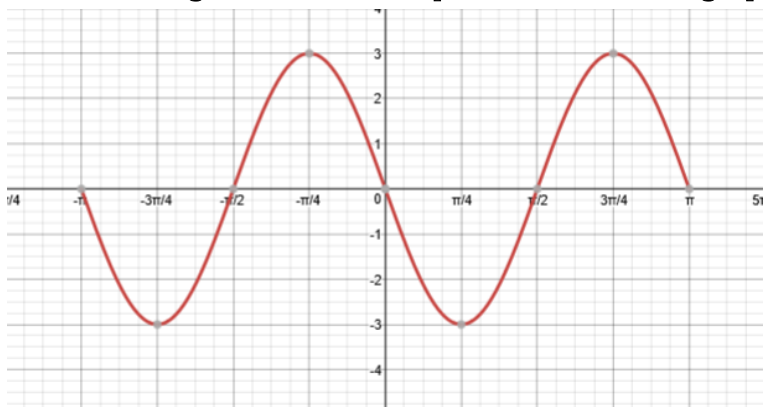
(D)



56. The reference angle of -240° is _____.

- (A) -120°
 (B) -60°
 (C) 60°
 (D) 120°

57. Which of the given functions represents the below graph



- (A) $y = -3\cos(2x)$
 (B) $y = -3\sin(2x)$
 (C) $y = 3\cos(2x)$
 (D) $y = 3\sin(2x)$

58. If $\sin \beta > 0$ and $\cot \beta < 0$ then the angle β lies in _____ .

- (A) First quadrant
 (B) Second quadrant
 (C) Third quadrant
 (D) Fourth quadrant

59. The acute angle that satisfies $\sin(4\alpha + 15^\circ) = \cos(5\alpha - 24^\circ)$ is _____.

- (A) 11°
 (B) 21°
 (C) 39°
 (D) None of the above

60. The range of $f(x) = \sqrt{2 + \sin x}$

- (A) $[0, \infty)$
 (B) $[2, \infty)$
 (C) $[1, 3]$
 (D) $[1, \sqrt{3}]$

Answer Key

Section 1

1. A
2. C
3. C
4. C
5. C
6. B
7. D
8. C
9. B
10. D
11. A
12. D
13. C
14. D
15. D
16. C
17. D
18. D
19. B
20. D
21. D
22. D
23. A
24. A
25. A
26. D
27. A
28. D
29. B
30. A

Section 2

31. B
32. C
33. C
34. B
35. D
36. C
37. C
38. B
39. D
40. D
41. C
42. A
43. B
44. D
45. B
46. D
47. C
48. D
49. B
50. C
51. A
52. B
53. D
54. D
55. B
56. C
57. B
58. B
59. A
60. D