1. Solve the following quadratic equation: $(x+k)^2+9=5$.

A. $x = k \pm 2i$
B. $x = -k \pm 2i$
C. $x = -k \pm 4i$
D. $x = k \pm 4i$

---

2. The solution set of the following quadratic equation: $x^2+100=-20x$ is

A. $\{-10, 10\}$
B. $\{10\}$
C. $(-10, 10)$
D. $\{-10\}$

---

3. Solve the following inequality $\dfrac{-4x^2-8x-4}{x^2+|-3x+1|} \leq 0$.

A. $S = (-\infty, -1) \cup (-1, +\infty)$
B. $S = (-\infty, +\infty)$
C. $S = (-1, +\infty)$
D. $S = \{-1\}$

---

4. Let $a > 2$ be a real number. Give the solution of following equation $x^2+ax+(a-1)=0$

A. $x=-1$ and $x=1+a$
B. $x=-1$ and $x=1-a$
C. ϕ
D. $x=-1$ and $x=a$

---

5. Let b be a real number. Give the value of b such that the equation $2x^2+bx+2=0$ admits exactly one (double) positive solution.

A. $b=-4$
B. $b=4$
C. $b=-2$
D. $b=2$

---

6. Solve the following inequality $\dfrac{x^2+6x+8}{x-1} \geq 0$.

A. $S = [-4, -2] \cup [1, +\infty)$
B. $S = (1, +\infty)$
C. $S = [-4, -2] \cup (1, +\infty)$
D. $S = (-\infty, -4] \cup [-2, 1)$

---

7. Suppose $a \in \mathbb{R}$. Give the value of a such that the equation $|2x + 3a| = |x + a|$ admit one solution.

A. $a = -1$
B. $a = 1$
C. $a = -\frac{1}{2}$
D. $a = 0$

---

8. Solve the following inequality $x^2 - 3|x^2 - 4| \geq x^2$

A. $S = [2, +\infty)$
B. $S = (-\infty, -2]$
C. $S = \{-2, 2\}$
D. $S = (-2, 2)$

---

9. The solution set of the following inequality $0 < -2 - 2(x - 1) \leq 2$ is

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

---

10. Give the domain of the function $f(x) = \dfrac{x^3 + 2x^2 - x - 1}{\sqrt{5 - |5 - 2x|}}$.

A. $dom(f) = (0, 5)$
B. $dom(f) = (-5, 0)$
C. $dom(f) = (-\infty, 0)$
D. $dom(f) = \mathbb{R}$

---

11. Let a be a real number. Give all values of a that make the relation F not a function.

$$F = \{(-a, -1), (5, 0), (a, 4), (-2, a), (1, 3)\}$$

A. $a \in \{1, 5, -2\}$
B. $a \in \mathbb{R}$
C. $a \in \{-1, 1, 5, -5, -2, 2, 0\}$
D. $a \in \mathbb{R}\backslash\{-1, 1, 5, -5, -2, 2\}$

---

12. Let $a \in \mathbb{R}\backslash\{-2\}$. Give the condition such that the point $(2a, -1)$ belongs to the line with equation $ax + 2y = 6$.

A. $a = -2$
B. $a = -1$
C. $a = 1$
D. $a = 2$

---

13. Let $b \in \mathbb{R}$ and $b \neq 1$. Give the value of b such that the line with equation $(b+1)x - y = 4$ is perpendicular to the line with the equation $bx + 2y = 3$.

A. $b = 1$
B. $b = -3$
C. $b = -2$
D. $b = 3$

---

14. If $f(x) = \dfrac{1}{x-1}$ and $g(x) = \dfrac{3x-10}{x+2}$, then domain of $(f \circ g)(x)$ is

A. $(-\infty, -2) \cup (-2, 6) \cup (6, \infty)$
B. $(-\infty, 2) \cup (2, 6) \cup (6, \infty)$
C. $(-\infty, -6) \cup (-6, 2) \cup (2, \infty)$
D. $(-\infty, -6) \cup (-6, -2) \cup (-2, \infty)$

---

15. Let $a = 1 + \sqrt{2}$ and $f(x) = 3x^2 - 5x - 3$. Evaluate $f(a)$.

A. $3 + \sqrt{2}$
B. $\sqrt{2}$
C. $1 + \sqrt{2}$
D. $1 + 3\sqrt{2}$

---

16. Let $f(x) = \frac{x}{x^2+6}$ and $g(x) = \sqrt{4 - x^2}$. Find $(f \circ g)(x)$.

A. $(f \circ g)(x) = \frac{1}{-x^2+10}$
B. $(f \circ g)(x) = \frac{\sqrt{4-x^2}}{-x^2+10}$
C. $(f \circ g)(x) = \frac{\sqrt{4-x^2}}{x^2+10}$
D. $(f \circ g)(x) = \frac{\sqrt{4-x^2}}{-x^2+2}$

---

17. If $f(x) = 5x^2 + 20x + 9$, then ...

A. $f(x) = 5(x+2)^2 + 11$
B. $f(x) = 5(x+2)^2 - 11$
C. $f(x) = -5(x-2)^2 + 11$
D. $f(x) = -5(x-2)^2 - 11$

---

18. Let $a > 0$. Let $f(x) = (a^2 - 7)x^2 - 2x + 4$ and $g(x) = -3x^2 + 2x + a$. Give the value of a such that the graphs of f and g open in the same direction and have the same width.

A. $a = 2$
B. $a = 1$
C. $a = -2$
D. $a = 4$

---

19. Let $a \in \mathbb{R}$ and $f(x) = -x^5 + ax - 2a$. Give the value of a such that $f(1-i)$ is a pure complex number using the remainder theorem.

A. $a = 4$
B. $a = -2$
C. $a = -1$
D. $a = 2$

---

20. The remainder of the division $\dfrac{x^4 - 10x^2 + 1}{x - \sqrt{2}}$ is

A. 0
B. -10
C. -15
D. -20

---

21. For the real numbers a and b, if $f(a+b) = 0$, then

A. $(x-a)$ is factor of $f(x)$.
B. $(x-b)$ is factor of $f(x)$.
C. $(x-a-b)$ is factor of $f(x)$.
D. $(x+a-b)$ is zero of $f(x)$.

---

22. The division of $x^3 + 3x^2 + 3x + 7$ by $(x+2)$ is equivalent to

A. $x^3 + 3x^2 + 3x + 7 = (x+2)(x^2 + x + 1) + 5$
B. $x^3 + 3x^2 + 3x + 7 = (x+2)(x^2 + x - 1) + 5$
C. $x^3 + 3x^2 + 3x + 7 = (x+2)(x^2 + x + 1) - 5$
D. $x^3 + 3x^2 + 3x + 7 = (x+2)(x^2 - x + 1) + 5$

---

23. The solution set of the equation $|x-3| = 3x - 5$, is

A. ϕ
B. $\{1, 2\}$
C. $\{2\}$
D. $\{1\}$

---

24. The equation of the line with slope 2 and passes through the point $(-3, -2)$ is

A. $y = -2x - 4$
B. $y = 2x + 4$
C. $y = 2x - 4$
D. $y = -2x + 4$

---

25. The inverse function of $f(x) = x^3 - 3$ is

A. $f^{-1}(x) = (x+3)^{\frac{1}{3}}$

B. $f^{-1}(x) = (x+3)^{-\frac{1}{3}}$

C. $f^{-1}(x) = (x-3)^{\frac{1}{3}}$

D. $f^{-1}(x) = (x-3)^{-\frac{1}{3}}$

---

26. Let $f(x) = x^2 - 1, g(x) = \dfrac{x^2+1}{x-1}$. Compute the value of $(fg)(2)$

A. 15
B. 7
C. 4
D. undefined

---

27. If $a \in R \setminus \{0\}$, $f(x) = -a^4x^3 + 9x^2$, then ...

A. f is linear

B. f is quadratic

C. f is cubic

D. f is quartic

---

28. Let $f(x) = \dfrac{1}{2}(x+1)^2 + 35$. The graph of $f(x)$ is ...

A. open down

B. open up

C. open right

D. open left

---

29. Determine the one-to-one function:

A. $F = \{(31, 31), (-33, 31), (10, -32)\}$

B. $F = \{(32, -33), (33, -34), (34, -33)\}$

C. $F = \{(36, -32), (35, 11), (33, 37)\}$

D. $F = \{(-35, -35), (32, 33), (30, -35)\}$

---

30. Determine the inverse function of $f(x) = \dfrac{7-3x}{2+5x}$

A. $f^{-1}(x) = \dfrac{7-2x}{3+5x}$

B. $f^{-1}(x) = \dfrac{7+2x}{3-5x}$

C. $f^{-1}(x) = \dfrac{7+2x}{3+5x}$

D. $f^{-1}(x) = \dfrac{7-2x}{3-5x}$

---

31. The zeros of $f(x) = (x-1)(x-2)(x+3)$ are

A. 1; -2 and -3.
B. -1; -2 and -3.
C. 1; 2 and -3.
D. 1; 2 and 3.

---

32. The function $f(x) = 3x^2 - 3$ is not one-to-one, because

A. $f(1) = 0$.
B. $f(x) \neq f(y)$ for all $x = y$.
C. $f(x) \neq f(y)$ for all $x \neq y$.
D. $f(-1) = f(1)$.

---

33. The solution set of the following inequality $x^2 - 3x + 2 > 0$ is

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

Theses exercises DO NOT represent the whole content of the exam.
You need to study the book.

Good Luck
