PRACTICE EXAM 10: ALEKS PPL SIMULATION

1. Which of the following is the graph of an even function?

A. A line with positive slope passing through the origin

B. A parabola with vertex on the y-axis

C. The graph of $y = x^3$

D. A logarithmic curve

2. Solve: $3(2x - 1) - 4(x + 2) = 5$.

A. $x = 1$

B. $x = 4$

C. $x = 6$

D. $x = 8$

3. A rectangle's diagonal has length 17 and one side has length 8. What is the area of the rectangle?

A. 120

B. 136

C. 144

D. 153

4. Simplify: $(x^{-1} + y^{-1})^{-1}$, assuming $x, y \neq 0$.

A. $x + y$

B. $1/(x + y)$

C. $xy/(x + y)$

D. $(x + y)/xy$

5. What is the equation of a vertical line passing through $(3, -4)$?

A. $y = 3$

B. $x = 3$

C. $y = -4$

D. $x = -4$

6. If $f(x) = \sqrt{x}$ and $g(x) = x + 5$, what is $(f \circ g)(4)$?

A. 3

B. 4

C. 5

D. 7

7. A pair of dice is rolled. What is the probability that the sum of the two dice equals 7?

A. 1/36

B. 1/18

C. 1/9

D. 1/6

8. Simplify: $(3x + 5)^2 - (3x - 5)^2$.

A. $10x^2$

B. 0

C. 60x

D. 30x + 25

9. The function $f(x) = 2x^2 - 8x + 3$ has its minimum at what x-value?

A. 2

B. 3

C. −2

D. 4

10. Which of the following is equivalent to $\log(x^2) - \log(x)$?

A. $\log(2x)$

B. $\log(x)$

C. $2 \log(x)$

D. $\log(x^2)$

11. A rectangular field measures 45 meters by 28 meters. A walkway of uniform width is built around the outside, increasing the total enclosed area to 1820 m^2. What is the width of the walkway?

A. 1 meter

B. 3 meters

C. 2.5 meters

D. 2 meters

12. The expression $\sqrt{(-49)}$ equals which of the following?

A. 7i

B. −7

C. Not a real number only

D. 7

13. Simplify: $4/(x - 3) \div 2/(x + 1)$, assuming $x \neq 3, -1$.

A. $2(x - 3)/(x + 1)$

B. $(x + 1)/(2(x - 3))$

C. $2(x + 1)/(x - 3)$

D. $8/[(x - 3)(x + 1)]$

14. A cone has a radius of 6 cm and a slant height of 10 cm. What is the height of the cone?

A. 4 cm

B. 8 cm

C. 12 cm

D. 16 cm

15. Which of the following equations has no real solutions?

A. $x^2 - 4 = 0$

B. $x^2 + 4x + 4 = 0$

C. $x^2 - 2x - 3 = 0$

D. $x^2 + 4 = 0$

16. Solve: $2^{(x^2 - 3)} = 32$.

A. $x = 2\sqrt{2}$ or $x = -2\sqrt{2}$

B. $x = 2$ or $x = -2$

C. $x = \sqrt{8}$ only

D. $x = 5$ only

17. If the probability of an event is 3/8, what are the odds in favor of the event?

A. 3:8

B. 3:5

C. 5:3

D. 8:3

18. Simplify: $\sqrt{(x^2 + 4x + 4)}$, assuming $x \geq -2$.

A. $x^2 + 2$

B. $x + 2$ or $-(x + 2)$

C. $(x + 2)^2$

D. $x + 2$

19. A line has equation $5x + y = 10$. What is the x-intercept?

A. 10

B. 5

C. 2

D. 1/2

20. If $\sin\theta = 1/3$ and θ is in Quadrant II, what is the exact value of $\cos\theta$?

A. $-2\sqrt{2}/3$

B. $2\sqrt{2}/3$

C. $\sqrt{2}/3$

D. $-\sqrt{2}/3$

21. Which of the following is a factor of $x^3 - 27$?

A. $x + 3$

B. $x^2 + 9$

C. $x - 3$

D. $x^2 - 9$

22. A farmer has 60 feet of fencing and wants to enclose a rectangular pen against a barn wall (only 3 sides need fencing). What dimensions maximize the area?

A. 15 ft by 30 ft

B. 20 ft by 20 ft

C. 10 ft by 40 ft

D. 12 ft by 36 ft

23. Simplify: $(1 - \cos^2\theta)/\sin\theta$, assuming $\sin\theta \neq 0$.

A. $\cos\theta$

B. $\tan\theta$

C. $\sec\theta$

D. $\sin\theta$

24. Solve for x: $(x - 2)/4 = 3/2$.

A. $x = 4$

B. $x = 8$

C. $x = 6$

D. $x = 10$

25. The graph of $f(x) = 2^x$ is reflected across the y-axis. What is the new function?

A. $g(x) = 2^{-x}$

B. $g(x) = -2^x$

C. $g(x) = 2^x + 1$

D. $g(x) = \log_2(x)$

26. A spinner is divided into 8 equal sectors numbered 1 through 8. What is the probability of spinning a prime number?

A. 1/4

B. 3/8

C. 1/2

D. 5/8

27. Find the sum of the solutions to $x^2 - 7x + 10 = 0$.

A. 5

B. 7

C. 10

D. 12

28. Simplify: $(x^3y^{-2})^2 \cdot (xy^2)^{-1}$.

A. x^6y^{-6}

B. x^5y^6

C. x^7y^{-2}

D. x^5y^{-6}

29. A cylinder's height is doubled while its radius is halved. What happens to its volume?

A. Volume is halved

B. Volume is unchanged

C. Volume doubles

D. Volume is quartered

30. What is the domain of $f(x) = 1/\sqrt{(x - 2)}$?

A. $x \geq 2$

B. $x \leq 2$

C. $x > 2$

D. $x < 2$

PRACTICE EXAM 10: ANSWER KEY AND EXPLANATIONS

1. B — An even function is symmetric about the y-axis, meaning $f(-x) = f(x)$. A parabola with vertex on the y-axis satisfies this condition. Lines through the origin (other than $y = 0$), cubic functions, and logarithmic curves fail this symmetry test.

2. D — Distribute: $6x - 3 - 4x - 8 = 5$, giving $2x - 11 = 5$. Add 11: $2x = 16$, so $x = 8$. Always combine like terms on each side before moving variables across the equation.

3. A — By the Pythagorean theorem: $8^2 + b^2 = 17^2$, giving $b^2 = 289 - 64 = 225$ and $b = 15$. Area = $8 \times 15 = 120$. The (8, 15, 17) triple is a common Pythagorean combination worth recognizing.

4. C — Combine inside the parentheses: $1/x + 1/y = (y + x)/(xy)$. Apply the negative exponent (reciprocal): $xy/(x + y)$. Complex fractions involving reciprocals simplify by combining first, then inverting.

5. B — A vertical line has constant x-value and equation $x = c$. A line through $(3, -4)$ that is vertical has equation $x = 3$. Vertical lines have undefined slope and no y-intercept unless $c = 0$.

6. A — Evaluate g first: $g(4) = 9$. Then evaluate $f(9) = \sqrt{9} = 3$. Composition applies the inside function first; the output becomes the input of the outer function.

7. D — Total outcomes from rolling two dice: 36. Outcomes summing to 7: (1,6), (2,5), (3,4), (4,3), (5,2), (6,1) = 6 favorable. Probability = $6/36 = 1/6$. A sum of 7 is the most likely single sum on two dice.

8. C — Apply the difference of squares pattern $(a + b)^2 - (a - b)^2 = 4ab$ with $a = 3x$ and $b = 5$: $4(3x)(5) = 60x$. Direct expansion also works: $(9x^2 + 30x + 25) - (9x^2 - 30x + 25) = 60x$. The clean identity saves time.

9. A — x-coordinate of vertex = $-b/(2a) = 8/(2 \cdot 2) = 2$. The parabola opens upward because $a = 2 > 0$, so the vertex represents a minimum. Substitute to verify the minimum value if needed.

10. B — Apply the quotient law: $\log(x^2) - \log(x) = \log(x^2/x) = \log(x)$. Always simplify inside the logarithm before applying the power law if the quotient cancels cleanly.

11. D — Let w = walkway width. Total dimensions: $(45 + 2w)(28 + 2w) = 1820$. Expand: $1260 + 90w + 56w + 4w^2 = 1820$, giving $4w^2 + 146w - 560 = 0$. Divide by 2: $2w^2 + 73w - 280 = 0$. Factor or use the quadratic formula to get $w = 2$ meters. Uniform-width walkway problems always add $2w$ to both dimensions.

12. A — The square root of a negative number is imaginary. $\sqrt{(-49)} = \sqrt{(49)} \cdot \sqrt{(-1)} = 7i$, where $i = \sqrt{(-1)}$. Complex numbers extend the real number system to include square roots of negatives.

13. C — Division becomes multiplication by the reciprocal: $4/(x - 3) \times (x + 1)/2 = 4(x + 1)/[2(x - 3)] = 2(x + 1)/(x - 3)$. The "keep, change, flip" rule applies identically to rational expressions.

14. B — The slant height, radius, and height form a right triangle. By the Pythagorean theorem: $h^2 + 6^2 = 10^2$, giving $h^2 = 64$ and $h = 8$ cm. Cone geometry requires distinguishing slant height (lateral surface) from perpendicular height (axis).

15. D — Check the discriminant $b^2 - 4ac$ for each. For $x^2 + 4 = 0$: discriminant $= 0 - 16 = -16 < 0$, so two complex solutions and no real solutions. Sum of squares never equals a negative number in the real system.

16. A — Rewrite 32 as 2^5: $2^{(x^2 - 3)} = 2^5$, so $x^2 - 3 = 5$, giving $x^2 = 8$ and $x = \pm 2\sqrt{2}$. Matching bases allows direct equating of exponents, and quadratic equations always allow both positive and negative roots.

17. B — Odds in favor = favorable : unfavorable. P(event) = 3/8 means 3 favorable out of 8 total, so 5 unfavorable. Odds ratio: 3:5. Odds and probability are related but not identical — odds compare favorable to unfavorable, while probability compares favorable to total.

18. D — The radicand factors as a perfect square: $x^2 + 4x + 4 = (x + 2)^2$. Square root gives $|x + 2|$. Since $x \geq -2$, the expression $(x + 2)$ is non-negative, so $|x + 2| = x + 2$. Domain restrictions determine which form of the absolute value applies.

19. C — To find x-intercept, set $y = 0$: $5x = 10$, giving $x = 2$. The x-intercept is $(2, 0)$. Always set the other variable equal to zero to find an intercept.

20. A — Using $\sin^2\theta + \cos^2\theta = 1$: $\cos^2\theta = 1 - 1/9 = 8/9$, so $\cos\theta = \pm\sqrt{(8/9)} = \pm(2\sqrt{2})/3$. In Quadrant II, cosine is negative: $\cos\theta = -2\sqrt{2}/3$. Simplify $\sqrt{8}$ as $2\sqrt{2}$.

21. C — $x^3 - 27$ is a difference of cubes: $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$ with $a = x$, $b = 3$, giving $(x - 3)(x^2 + 3x + 9)$. Therefore $x - 3$ is a factor. Memorize sum-and-difference-of-cubes patterns.

22. A — Only three sides need fencing: $2x + y = 60$, where y is parallel to the barn. Express $y = 60 - 2x$. Area: $A = x(60 - 2x) = 60x - 2x^2$. Maximum at vertex: $x = -60/(2 \cdot -2) = 15$. Then $y = 30$. Dimensions 15×30.

23. D — By the Pythagorean identity, $1 - \cos^2\theta = \sin^2\theta$. So the expression becomes $\sin^2\theta/\sin\theta = \sin\theta$. Always look for opportunities to substitute one side of the fundamental Pythagorean identity into another expression.

24. B — Cross-multiply: $2(x - 2) = 12$, giving $2x - 4 = 12$ and $2x = 16$, so $x = 8$. Proportion problems with two fractions are solved by cross-multiplication followed by standard linear steps.

25. A — Reflection across the y-axis replaces x with −x: $f(-x) = 2^{-x}$. The exponent becomes negative because the sign of the input flips. This also equals $(1/2)^x$, but only 2^{-x} is listed.

26. C — Prime numbers between 1 and 8: 2, 3, 5, 7 → 4 favorable outcomes out of 8. Probability = 4/8 = 1/2. Always check whether 1 counts as prime (it does not); primes are integers greater than 1 divisible only by 1 and themselves.

27. B — By Vieta's formulas, the sum of roots of $ax^2 + bx + c = 0$ equals $-b/a$. For $x^2 - 7x + 10 = 0$: sum = 7. Alternatively, factor as $(x - 5)(x - 2) = 0$, giving roots 5 and 2 with sum 7.

28. D — Apply the power to the first factor: $(x^3y^{-2})^2 = x^6y^{-4}$. Apply the negative exponent to the second: $(xy^2)^{-1} = x^{-1}y^{-2}$. Multiply: $x^6y^{-4} \cdot x^{-1}y^{-2} = x^5y^{-6}$. Always apply outer exponents before combining factors.

29. A — Original volume: $\pi r^2 h$. New radius is r/2 and new height is 2h. New volume: $\pi(r/2)^2(2h) = \pi(r^2/4)(2h) = \pi r^2 h/2$, which is half the original. Squaring the halved radius outweighs the doubled height.

30. C — The radicand of a square root must be non-negative, and the denominator cannot be zero. So $x - 2 > 0$ (strictly greater because zero in the denominator is forbidden), giving $x > 2$. Combined restrictions from multiple operations produce the final domain.