

Algebra 2 & Geometry

Core Unit Practice Problems · 20 Questions · Multiple Choice

Name: _____

Date: _____

Score: _____ / 20

PART A — ALGEBRA 2

Quadratic Functions · Vertex Form

1. The parabola $y = -3(x + 4)^2 - 7$ is shifted 2 units right and 5 units up.

What is the vertex of the new parabola?

■ *Memory: vertex form $y = a(x-h)^2 + k \rightarrow$ vertex = (h, k)*

A. (-6, -2)

B. (-2, -2)

C. (-2, 2)

D. (2, -2)

Quadratic Equations · Discriminant

2. For what value of k does $2x^2 - kx + 8 = 0$ have exactly one real solution?

■ *Memory: discriminant = $b^2 - 4ac$ (+) two roots (0) one root (-) no real roots*

A. $k = 4$

B. $k = 8$

C. $k = \pm 8$

D. $k = \pm 4$

Polynomial Functions · End Behavior

3. Which describes the end behavior of $f(x) = -2x^4 + 4x^3 - x$?

■ *Memory: odd degree + negative leading \rightarrow left UP, right DOWN ($\uparrow\downarrow$ flipped)*

A. $x \rightarrow +\infty: f \rightarrow +\infty$; $x \rightarrow -\infty: f \rightarrow -\infty$

B. $x \rightarrow +\infty: f \rightarrow -\infty$; $x \rightarrow -\infty: f \rightarrow +\infty$

C. Both ends go to $+\infty$

D. Both ends go to $-\infty$

Rational Expressions · Asymptotes

4. Find all asymptotes of $f(x) = (3x^2 - 1) / (x^2 - 4)$

■ *Memory: VA \rightarrow set denominator=0 | HA \rightarrow compare degrees (equal degrees \rightarrow ratio of leading coeff.)*

A. Vertical: $x = 4$; Horizontal: $y = 3$

B. Vertical: $x = \pm 2$; Horizontal: $y = 3$

C. Vertical: $x = \pm 2$; Horizontal: $y = 0$

D. Vertical: $x = 2$; Horizontal: $y = 3$

C. Center (3, -4), $r = 16$

D. Center (6, -8), $r = 4$

16. A 10x8 rectangle has a semicircle (diameter = 8) cut from one end. Find remaining area. (Use $\pi \approx 3.14$)

■ Memory: composite area = big shape - hole | always identify ALL shapes first!

- A. 54.93
B. 55.44
C. 67.28
D. 79.72

Transformations · Rotation 90° CCW

17. Point P = (3, -5) is rotated 90° counter-clockwise about the origin. New coordinates?

■ Memory: 90° CCW rotation rule: $(x, y) \rightarrow (-y, x)$

- A. (5, 3)
B. (-5, -3)
C. (-3, 5)
D. (5, -3)

Volume · Cone vs Cylinder

18. A cone and a cylinder have the same radius and height. What is the ratio of their volumes?

■ Memory: $V(\text{cone}) = (1/3)\pi r^2 h$ | $V(\text{cylinder}) = \pi r^2 h \rightarrow$ cone is always 1/3 of cylinder

- A. 1 : 2
B. 1 : 3
C. 2 : 3
D. 3 : 1

Trigonometry · Law of Sines

19. In $\triangle ABC$: $\angle A = 40^\circ$, $\angle B = 75^\circ$, $a = 12$. Find b . ($\sin 40^\circ \approx 0.643$, $\sin 75^\circ \approx 0.966$)

■ Memory: $a/\sin A = b/\sin B = c/\sin C$ | use when given angle-side-angle (ASA or AAS)

- A. ≈ 7.98
B. ≈ 14.6
C. ≈ 18.0
D. ≈ 11.6

Coordinate Geometry · Perpendicular Lines

20. Line ℓ passes through (2, 5) and is perpendicular to $y = (2/3)x - 4$. Find the equation of ℓ .

■ Memory: perpendicular slopes are NEGATIVE RECIPROCALs | $m_\ell \times m_{\perp} = -1$

- A. $y = (2/3)x + 11/3$
B. $y = -(3/2)x + 8$
C. $y = (3/2)x + 2$
D. $y = -(3/2)x - 8$
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ANSWER KEY

| | | | |
|--------------|--------------|--------------|--------------|
| 1. B | 2. C | 3. B | 4. B |
| 5. A | 6. B | 7. A | 8. B |
| 9. A | 10. A | 11. B | 12. B |
| 13. C | 14. C | 15. C | 16. A |
| 17. A | 18. B | 19. C | 20. B |