A Level Further Mathematics Core Pure Practice Test (Sample)

Study Guide

BY EXAMZIFY

Everything you need from our exam experts!

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Introduction

Preparing for a certification exam can feel overwhelming, but with the right tools, it becomes an opportunity to build confidence, sharpen your skills, and move one step closer to your goals. At Examzify, we believe that effective exam preparation isn’t just about memorization, it’s about understanding the material, identifying knowledge gaps, and building the test-taking strategies that lead to success.

This guide was designed to help you do exactly that.

Whether you’re preparing for a licensing exam, professional certification, or entry-level qualification, this book offers structured practice to reinforce key concepts. You’ll find a wide range of multiple-choice questions, each followed by clear explanations to help you understand not just the right answer, but why it’s correct.

The content in this guide is based on real-world exam objectives and aligned with the types of questions and topics commonly found on official tests. It’s ideal for learners who want to:

- **Practice answering questions under realistic conditions,**
- **Improve accuracy and speed,**
- **Review explanations to strengthen weak areas, and**
- **Approach the exam with greater confidence.**

We recommend using this book not as a stand-alone study tool, but alongside other resources like flashcards, textbooks, or hands-on training. For best results, we recommend working through each question, reflecting on the explanation provided, and revisiting the topics that challenge you most.

Remember: successful test preparation isn’t about getting every question right the first time, it’s about learning from your mistakes and improving over time. Stay focused, trust the process, and know that every page you turn brings you closer to success.

Let’s begin.

How to Use This Guide

This guide is designed to help you study more effectively and approach your exam with confidence. Whether you're reviewing for the first time or doing a final refresh, here’s how to get the most out of your Examzify study guide:

1. Start with a Diagnostic Review

Skim through the questions to get a sense of what you know and what you need to focus on. Your goal is to identify knowledge gaps early.

2. Study in Short, Focused Sessions

Break your study time into manageable blocks (e.g. 30 – 45 minutes). Review a handful of questions, reflect on the explanations.

3. Learn from the Explanations

After answering a question, always read the explanation, even if you got it right. It reinforces key points, corrects misunderstandings, and teaches subtle distinctions between similar answers.

4. Track Your Progress

Use bookmarks or notes (if reading digitally) to mark difficult questions. Revisit these regularly and track improvements over time.

5. Simulate the Real Exam

Once you're comfortable, try taking a full set of questions without pausing. Set a timer and simulate test-day conditions to build confidence and time management skills.

6. Repeat and Review

Don’t just study once, repetition builds retention. Re-attempt questions after a few days and revisit explanations to reinforce learning. Pair this guide with other Examzify tools like flashcards, and digital practice tests to strengthen your preparation across formats.

There’s no single right way to study, but consistent, thoughtful effort always wins. Use this guide flexibly, adapt the tips above to fit your pace and learning style. You've got this!

Questions

1. **Which value equals $(\alpha+\beta)^3$?**
   - A. $\alpha^3 + \beta^3 + 3\alpha\beta(\alpha+\beta)$
   - B. $\alpha^3 + \beta^3$
   - C. $\alpha^3 + \beta^3 + 6\alpha\beta(\alpha+\beta)$
   - D. $\alpha^2\beta^2$

2. **If $a > 0$ and all four roots are positive, what can be said about the sign of b?**
   - A. $b > 0$
   - B. $b < 0$
   - C. $b = 0$
   - D. b can be any sign

3. **The sum of squares $S = \alpha^2 + \beta^2 + \gamma^2 + \delta^2$ can be written in terms of a, b, c as which of the following?**
   - A. $(b^2 - 2ac)/a^2$
   - B. $(b^2 + 2ac)/a^2$
   - C. $(b^2 - 2ad)/a^2$
   - D. $b^2/a^2 - 2c/a$

4. **Under what condition does a square matrix have an inverse?**
   - A. $\det M \neq 0$
   - B. $\det M = 0$
   - C. M is symmetric
   - D. M is diagonalizable

5. **Which description best defines Cartesian form of a complex number?**
   - A. The equation given in terms of coordinates relative to the x, y axes
   - B. The equation given in terms of polar coordinates
   - C. The equation $z = re^{i \theta}$
   - D. The equation in terms of real numbers only

6. For a quadratic equation $ax^2 + bx + c = 0$ with real coefficients, if $b^2 - 4ac > 0$, what is the nature of the roots?

A. Two distinct real roots

B. One real root

C. No real roots

D. All real numbers

7. Which of the following statements characterizes a non-singular matrix?

A. A matrix with determinant zero

B. A matrix that has an inverse

C. A matrix with all zero entries

D. A matrix with no inverse

8. The volume of a solid formed by rotating the curve $x = g(y)$ about the y-axis is given by which integral?

A. $\pi \int y^2 \, dx$

B. $\pi \int g(y)^2 \, dy$

C. $\pi \int x^2 \, dy$

D. $2\pi \int x \, dy$

9. Which statement about the determinant is true?

A. It can be positive, negative, or zero

B. It can only be positive

C. It is always zero

D. It is always positive

10. If the quartic is monic, the product $\alpha\beta\gamma\delta$ equals which expression?

A. e

B. a

C. $-d$

D. e/a

Answers

1. **A**
2. **B**
3. **A**
4. **A**
5. **A**
6. **A**
7. **B**
8. **C**
9. **A**
10. **D**

Explanations

1. Which value equals $(\alpha+\beta)^3$?

A. $\alpha^3 + \beta^3 + 3\alpha\beta(\alpha+\beta)$

B. $\alpha^3 + \beta^3$

C. $\alpha^3 + \beta^3 + 6\alpha\beta(\alpha+\beta)$

D. $\alpha^2\beta^2$

Expanding a cube of a sum uses the binomial terms: $(\alpha+\beta)^3 = \alpha^3 + 3\alpha^2\beta + 3\alpha\beta^2 + \beta^3$. The middle two terms factor as $3\alpha\beta(\alpha+\beta)$, so the full expression becomes $\alpha^3 + \beta^3 + 3\alpha\beta(\alpha+\beta)$. This matches the given form. The other options miss the cross terms, overcount them, or are not cubic in total.

2. If $a > 0$ and all four roots are positive, what can be said about the sign of b?

A. $b > 0$

B. $b < 0$

C. $b = 0$

D. b can be any sign

Think of the polynomial as $a(x - r1)(x - r2)(x - r3)(x - r4)$ with $a > 0$ and all roots r1, r2, r3, r4 positive. When you expand, the coefficient of x^3 is $-a$ times the sum $r1 + r2 + r3 + r4$. Since each root is positive, that sum is positive, and with $a > 0$ the whole thing is negative. So the sign of the x^3 coefficient, namely b, must be negative. Therefore $b < 0$. The constant term would be a times the product r1r2r3r4, which is also positive, and the other signs follow the same pattern.

3. The sum of squares $S = \alpha^2 + \beta^2 + \gamma^2 + \delta^2$ can be written in terms of a, b, c as which of the following?

A. $(b^2 - 2ac)/a^2$

B. $(b^2 + 2ac)/a^2$

C. $(b^2 - 2ad)/a^2$

D. $b^2/a^2 - 2c/a$

Think about how the squares of the roots relate to the sums of the roots and the pairwise products. If α, β, γ, δ are roots of a polynomial with leading coefficient a, then the sum of the roots is $-b/a$ and the sum of all pairwise products is c/a. The sum of squares is $S = (\alpha+\beta+\gamma+\delta)^2 - 2(\alpha\beta+\alpha\gamma+\alpha\delta+\beta\gamma+\beta\delta+\gamma\delta) = (-b/a)^2 - 2(c/a) = b^2/a^2 - 2c/a = (b^2 - 2ac)/a^2$. This matches the given form.

4. Under what condition does a square matrix have an inverse?

A. det M ≠ 0

B. det M = 0

C. M is symmetric

D. M is diagonalizable

A square matrix is invertible if and only if its determinant is not zero. This is because a nonzero determinant means the linear transformation represented by the matrix scales volumes by a nonzero factor, so no information is lost and there exists an inverse transformation that undoes it. Conversely, if the determinant is zero, the transformation collapses some dimension, the rows (or columns) are linearly dependent, and no matrix can reverse that loss of information, so no inverse exists. Properties like symmetry or diagonalizability don't guarantee invertibility on their own: a symmetric matrix can have det zero, and a diagonalizable matrix can be singular if zero is one of its eigenvalues.

5. Which description best defines Cartesian form of a complex number?

A. The equation given in terms of coordinates relative to the x, y axes

B. The equation given in terms of polar coordinates

C. The equation z = re^{i theta}

D. The equation in terms of real numbers only

Cartesian form describes a complex number by its rectangular coordinates in the complex plane. It writes z as x + i y, where x is the real part and y is the imaginary part, giving the position (x, y) relative to the x-axis and y-axis. This is exactly what it means to use coordinates on the axes. The polar form would use r and θ, or z = r e^{iθ}, and the idea of "real numbers only" misses the imaginary part represented by i.

6. For a quadratic equation ax^2 + bx + c = 0 with real coefficients, if b^2 - 4ac > 0, what is the nature of the roots?

A. Two distinct real roots

B. One real root

C. No real roots

D. All real numbers

The key idea is the discriminant of a quadratic with real coefficients. If b^2 - 4ac is positive, the square root in the quadratic formula is real and nonzero, so you get two different real solutions: x = (-b ± sqrt(b^2 - 4ac)) / (2a). Since the discriminant is greater than zero, those two values are distinct, giving two distinct real roots. This assumes a ≠ 0, since it's a quadratic. If the discriminant were zero you'd have one real (repeated) root, if it were negative there would be no real roots, and "all real numbers" isn't possible for a single quadratic.

7. Which of the following statements characterizes a non-singular matrix?

A. A matrix with determinant zero

B. A matrix that has an inverse

C. A matrix with all zero entries

D. A matrix with no inverse

Non-singular means the matrix is invertible. That happens exactly when you can find a matrix that serves as its inverse, so you can always solve Ax = b uniquely for any b. Equivalently, the determinant is not zero and the columns (or rows) are linearly independent. The statement that best captures this is that the matrix has an inverse. If the determinant were zero, or if there were no inverse, that would describe a singular (non-invertible) matrix. The option describing all-zero entries also fails because that matrix has determinant zero and no inverse.

8. The volume of a solid formed by rotating the curve x = g(y) about the y-axis is given by which integral?

A. $\pi \int y^2\, dx$

B. $\pi \int g(y)^2\, dy$

C. $\pi \int x^2\, dy$

D. $2\pi \int x\, dy$

Rotating a region about a vertical axis and using discs means each cross-section perpendicular to the axis is a circle whose radius is the distance to the axis. Here that distance is x, and since x = g(y), the radius of a disk at height y is g(y). A thin slice at height y contributes a volume dV = area × thickness = $\pi[g(y)]^2\, dy$. Integrating over the y-range of the region gives $V = \pi \int g(y)^2\, dy$. Because x is the radius, you can also write this as $\pi \int x^2\, dy$, with x understood as the function g(y). That matches the intended form. The other forms don't align with using discs around the y-axis or with the radius being the x-value.

9. Which statement about the determinant is true?

A. It can be positive, negative, or zero

B. It can only be positive

C. It is always zero

D. It is always positive

The determinant measures how a linear transformation scales area (and, in higher dimensions, volume) and whether it preserves or reverses orientation. Because of that, its value can be positive, negative, or zero. For example, the identity matrix scales area by 1 and preserves orientation, giving a positive determinant. A matrix that flips orientation, like a reflection, has a negative determinant. If the rows (or columns) are proportional, the transformation collapses area to zero, so the determinant is zero. A simple zero example is [[1, 2], [2, 4]], where the second row is a multiple of the first. Therefore, the determinant is not restricted to one sign and can take positive, negative, or zero values depending on the matrix.

10. If the quartic is monic, the product αβγδ equals which expression?

A. e

B. a

C. -d

D. e/a

Vieta's formulas tell us how the roots of a polynomial relate to its coefficients. For a quartic written as a x^4 + b x^3 + c x^2 + d x + e = 0 with roots α, β, γ, δ, you can factor it as a(x−α)(x−β)(x−γ)(x−δ)=0. Expanding shows the constant term is a times the product of the roots, so e = a αβγδ. Rearranging gives αβγδ = e/a. Note: if the quartic were monic (leading coefficient 1), the product would be e/1 = e. The given form uses leading coefficient a, hence the product is e/a.

Next Steps

Congratulations on reaching the final section of this guide. You've taken a meaningful step toward passing your certification exam and advancing your career.

As you continue preparing, remember that consistent practice, review, and self-reflection are key to success. Make time to revisit difficult topics, simulate exam conditions, and track your progress along the way.

If you need help, have suggestions, or want to share feedback, we’d love to hear from you. Reach out to our team at hello@examzify.com.

Or visit your dedicated course page for more study tools and resources:

https://alevelfurthermathcore.examzify.com

We wish you the very best on your exam journey. You've got this!