



Precalculus

TESTS MASTERY OF ALGEBRA 2 • 20 ITEMS • 75-90 MINUTES • CALCULATOR ON SECTION B ONLY

This diagnostic checks whether function reasoning, quadratic fluency and the geometry Algebra 2 draws on are secure enough for a broader family of nonlinear models. Several items test whether a student can move between a graph, a table and an equation rather than working only in symbols.

BEFORE YOU BEGIN

No calculator unless a question says otherwise. Show your working - the method tells us more than the answer.
Leave a question blank rather than guessing. A blank tells us it is unfamiliar; a wrong answer tells us what is believed.
Work alone. Nobody should explain the mathematics or suggest a method.
Stop and resume later if you tire. This is a picture of understanding, not a race.

SECTION A Multiple choice

10 items

Choose one answer. If you are unsure, leave it blank rather than guessing.

01 The graph of $y = (x - 3)^2 + 2$ has its vertex at

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

02 Solve: $x^2 = 16$

- A) $x = 4$ or $x = -4$
- B) $x = 4$
- C) $x = 8$
- D) $x = 16$

03 Simplify: $\sqrt{50}$

- A) $5\sqrt{2}$
- B) $25\sqrt{2}$
- C) $\sqrt{25}\cdot\sqrt{25}$
- D) $10\sqrt{5}$



- 04 If $f(x) = x^2$ and $g(x) = x + 1$, then $f(g(2)) =$
- A) 9
 - B) 5
 - C) 6
 - D) 4
- 05 The discriminant of $x^2 + 2x + 5$ tells us the equation has
- A) No real roots
 - B) Two real roots
 - C) One repeated root
 - D) Three roots
- 06 $\log(1000)$ in base 10 equals
- A) 3
 - B) 100
 - C) 10
 - D) $\frac{1}{3}$
- 07 Which is equivalent to x^{-2} ?
- A) $1/x^2$
 - B) $-x^2$
 - C) $-1/x^2$
 - D) x^2
- 08 A right triangle has legs 5 and 12. $\sin$ of the angle opposite the side of length 5 is
- A) $\frac{5}{13}$
 - B) $\frac{5}{12}$
 - C) $\frac{12}{13}$
 - D) $\frac{13}{5}$
- 09 The domain of $f(x) = 1/(x - 4)$ excludes
- A) $x = 4$
 - B) $x = 0$
 - C) $x = -4$
 - D) nothing



10 An arithmetic sequence starts 3, 7, 11, ... The 10th term is

- A) 39
- B) 40
- C) 43
- D) 30

SECTION B Student solving

6 items

Show your working. We are reading the method, not only the answer.

11 Solve by completing the square, showing every step: $x^2 + 6x - 7 = 0$

12 Simplify fully: $(x^2 - 9)/(x^2 + 7x + 12)$



- 13 Solve: $2^x = 32$. Then solve $2^x = 30$ and explain why the second is harder.

- 14 A ball is thrown so its height is $h = -5t^2 + 20t$. Find when it lands and its maximum height.

- 15 Given $f(x) = 2x - 3$, find the inverse function and verify it with one value.



- 16 Describe how the graph of $y = -2(x + 1)^2 - 4$ differs from $y = x^2$. Be specific about each change.

SECTION C Error analysis

4 items

Each shows work containing a mistake. Find the FIRST incorrect step, say what the student believed, and give the correct answer.

- 17 Find the first incorrect step and correct it.

$$\begin{aligned}x^2 &= 16 \\ x &= 4\end{aligned}$$

- 18 Find the first incorrect step and give the correct simplification.

$$\begin{aligned}&(x^2 - 9)/(x - 3) \\ &= (x^2 - 9)/(x - 3) \\ &= x^2 - 3\end{aligned}$$

- 19 Find the error and give the correct value.

$$\begin{aligned}&\log(a) + \log(b) \\ &= \log(a + b)\end{aligned}$$

- 20 Explain what is wrong with this reasoning about the graph.

$$y = (x - 3)^2$$

Student: the minus three means
the graph moves 3 units LEFT.

What happens next

Bring this completed sheet to your consultation. A tutor reads it alongside a short conversation with the student and any school work you choose to share, then recommends a level. No placement is ever decided by a score on its own, and no student is placed without a tutor's approval.