



Precalculus

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

This diagnostic checks whether advanced function reasoning is mature enough for a unified study of functions, trigonometry and change. Precalculus punishes fragile algebra severely, so several items deliberately revisit the Algebra II skills that most often remain half-formed.

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 period of $y = \sin(2x)$ is
- A) π
 - B) 2π
 - C) 4π
 - D) $\pi/2$
- 02** $\cos(0)$ equals
- A) 1
 - B) 0
 - C) -1
 - D) undefined
- 03** The end behaviour of $f(x) = -x^3$ as x approaches positive infinity is
- A) $f(x)$ approaches negative infinity
 - B) $f(x)$ approaches positive infinity
 - C) $f(x)$ approaches 0
 - D) $f(x)$ oscillates



- 04 Which is the exact value of $\sin(30 \text{ degrees})$?
- A) $1/2$
 - B) $\sqrt{3}/2$
 - C) $\sqrt{2}/2$
 - D) 1
- 05 If $f(x) = \ln(x)$, the domain is
- A) $x > 0$
 - B) $x \geq 0$
 - C) all real x
 - D) x is not 0
- 06 The vertical asymptote of $f(x) = 1/(x + 2)$ is at
- A) $x = -2$
 - B) $x = 2$
 - C) $y = 0$
 - D) $x = 0$
- 07 In a triangle with sides a , b and included angle C , the Law of Cosines gives $c^2 =$
- A) $a^2 + b^2 - 2ab \cdot \cos(C)$
 - B) $a^2 + b^2$
 - C) $a^2 + b^2 + 2ab \cdot \cos(C)$
 - D) $a^2 - b^2$
- 08 The sum of the infinite geometric series $1 + 1/2 + 1/4 + \dots$ is
- A) 2
 - B) 1
 - C) infinite
 - D) $3/2$
- 09 Converting the point $(2, \pi/2)$ from polar to rectangular gives
- A) $(0, 2)$
 - B) $(2, 0)$
 - C) $(1, 1)$
 - D) $(2, \pi/2)$



10 As x approaches 2, the value of $(x^2 - 4)/(x - 2)$ approaches

- A) 4
- B) 0
- C) undefined
- D) 2

SECTION B Student solving

6 items

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

11 Sketch $y = 2\sin(x) + 1$ for 0 to 2π . Label amplitude, period, and the midline.

12 Solve for x : $3^{(x+1)} = 81$. Show your method.



- 13 Find the exact value of $\cos(\pi/3) + \sin(\pi/6)$, showing the unit circle reasoning.

- 14 Given $f(x) = x^2$ and $g(x) = \sqrt{x - 1}$, find $f(g(x))$ and state its domain.

- 15 A quantity decays so that half remains every 6 years. Write a model and find how much of 200 units remains after 18 years.



- 16 Explain, using the graph of $y = 1/x$, what happens as x approaches 0 from the right and from the left.

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.

$$\begin{aligned}\sqrt{x^2 + 9} \\ = x + 3\end{aligned}$$

- 18 Find the error and correct it.

$$\begin{aligned}\text{Solve } \sin(x) = 0.5 \text{ for } 0 \text{ to } 2\pi \\ x = 30 \text{ degrees only}\end{aligned}$$

- 19 Find the flawed step and give the correct simplification.

$$\begin{aligned}\ln(x^2) \\ = (\ln x)^2\end{aligned}$$

- 20 Explain why this conclusion does not follow.

$$\begin{aligned}f(x) &= (x^2 - 4)/(x - 2) \\ \text{Student: } f &\text{ is undefined at } x = 2, \\ &\text{so the graph has a vertical} \\ &\text{asymptote there.}\end{aligned}$$

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.