

Essential Pre-Calculus Mastery

Mathematics · Answer Key · 10 Questions

1. What is the range of the principal branch of the inverse secant function, $\text{arcsec}(x)$?

- A) $[0, \pi]$, $x \neq \pm \frac{1}{2}$
- B) $(-\frac{\pi}{2}, \frac{\pi}{2})$, $x \neq 0$
- C) $[0, \frac{\pi}{2}) \cup (\frac{\pi}{2}, \pi]$**
- D) $(-\frac{\pi}{2}, 0) \cup (0, \frac{\pi}{2})$

2. Which value represents the exact numerical limit of $(1 + \frac{1}{n})^n$ as n approaches infinity?

- A) The square root of 2
- B) The golden ratio (ϕ)
- C) Euler's number (e)**
- D) The natural logarithm of 10

3. For a conic section defined by $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$, what condition must be met for the curve to be a hyperbola?

- A) $B^2 - 4AC = 0$
- B) $B^2 - 4AC < 0$
- C) $B^2 - 4AC > 0$**
- D) $A = C$ and $B = 0$

4. What is the period of the function $f(x) = \tan(bx)$ where $b > 0$?

- A) $2\pi/b$
- B) π/b**
- C) $1/b$
- D) π

5. According to the Rational Root Theorem, if $P(x) = a_n x^n + \dots + a_0$ has a rational root p/q , what must be true about q ?

- A) q must be a factor of the leading coefficient a_n**
- B) q must be a factor of the constant term a_0
- C) q must be prime
- D) q must equal a_n

6. What are the horizontal and vertical asymptotes of the function $f(x) = \frac{(x^2 - 1)}{(x^2 - 4)}$?

A) $y=1, x=\pm 2$

B) $y=0, x=\pm 1$

C) $y=1, x=\pm 1$

D) $y=0, x=\pm 2$

7. Which trigonometric identity correctly represents the double-angle formula for cosine in terms of sine only?

A) $\cos(2\theta) = 1 - 2\sin^2(\theta)$

B) $\cos(2\theta) = 2\sin^2(\theta) - 1$

C) $\cos(2\theta) = 1 + \sin^2(\theta)$

D) $\cos(2\theta) = \sin^2(\theta) - 1$

8. If a sequence is defined by $a_n = a_1 \cdot r^{(n-1)}$, what is the formula for the sum of the first n terms when $r \neq 1$?

A) $S_n = a_1(1-r^n) / (1-r)$

B) $S_n = a_1(1-r^n) / (1+r)$

C) $S_n = n/2 \cdot (a_1 + a_n)$

D) $S_n = a_1 / (1-r)$

9. What is the magnitude of the complex number $z = 3 - 4i$?

A) 1

B) 5

C) 7

D) 25

10. Which property must a function $f(x)$ possess for its inverse function $f^{-1}(x)$ to exist?

A) It must be periodic

B) It must be even

C) It must be one-to-one (injective)

D) It must be discontinuous