

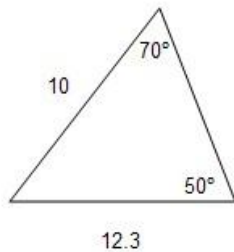
PRECALCULUS INDIVIDUAL TEST—WANDO MATH TOURNAMENT

Note—NOTA (choice E) means “None of these answers” is correct

1) Find the period and amplitude of the function $f(x) = 4 + 2\sin\left(\frac{x}{2} + \frac{\pi}{4}\right)$

- A) period= 4π , amplitude= 4
- B) period= 4π , amplitude= 2
- C) period= $\pi/2$, amplitude= 4
- D) period= $\pi/2$, amplitude= 2
- E) NOTA

2) Find the area (to the closest tenth) of the triangle pictured below.



- A) 53.3 units²
- B) 57.8 units²
- C) 44.0 units²
- D) 61.5 units²
- E) NOTA

3) Express $6\left(\cos\frac{7\pi}{4} + i\sin\frac{7\pi}{4}\right)$ in rectangular form.

- A) $-\frac{\sqrt{2}}{2} + i\frac{\sqrt{2}}{2}$
- B) $\frac{\sqrt{2}}{2} - i\frac{\sqrt{2}}{2}$
- C) $3\sqrt{2} - 3i\sqrt{2}$
- D) $-3\sqrt{2} + 3i\sqrt{2}$
- E) NOTA

4) Simplify: $6^{\log_6 9 + \log_6 3}$

- A) 3
- B) 12
- C) 27
- D) 216
- E) NOTA

5) A colony of bacteria increases according to the laws of uninhibited growth. If the colony begins with 100 bacteria at 6:00 A.M., and at 8:00 A.M. there are 150 bacteria, at approximately what time will the colony have doubled from its original size?

- A) 8:12 A.M.
- B) 9:25 A.M.
- C) 10:00 A.M.
- D) 12:16 P.M.
- E) NOTA

PRECALCULUS INDIVIDUAL TEST—WANDO MATH TOURNAMENT

6) If $f(x) = 2x^3 - 4x$ find $\frac{f(x+h) - f(x)}{h}$.

- A) $6x^2 - 4$ B) $3x^2 + 3xh + h^2 - 4$ C) $6x^2 - 4 + h$
 D) $6x^2 + 6xh + 2h^2 - 4$ E) NOTA

7) Evaluate $\cos^2 1^\circ + \cos^2 2^\circ + \cos^2 3^\circ + \dots + \cos^2 89^\circ + \cos^2 90^\circ$

- A) 44 B) 45 C) $44 + \frac{\sqrt{2}}{2}$
 D) 46 E) NOTA

8) If $x = \log_3 7$, find the value of $\log_7 81$ in terms of x .

- A) $x \left(\frac{\ln 81}{\ln 3} \right)$ B) $\log_4 \frac{81}{x}$ C) $\frac{x}{4}$
 D) $\frac{4}{x}$ E) NOTA

9) If $a < 0$ which of the following *cannot* be true?

- A) $\text{Arcsin } a = -\frac{\pi}{4}$ B) $\text{Arccos } a = \frac{3\pi}{4}$ C) $\text{Arctan } a = -\frac{\pi}{4}$
 D) $\text{Arccot } a = -\frac{\pi}{4}$ E) NOTA

10) A pool is in the shape of a cylinder with inner radius 15 feet and inner height 8 feet. A pipe is putting water into the pool at a rate of 3 cubic feet per hour. Another pipe is taking water out of the pipe at a rate of 2 cubic feet per hour. If the pool starts out empty, how many hours will it take to fill the pool with both pipes open? Round to the nearest tenth of an hour.

- A) 5654.9 hrs B) 1800.0 hrs C) 942.5 hrs
 D) 377.0 hrs E) NOTA

PRECALCULUS INDIVIDUAL TEST—WANDO MATH TOURNAMENT

11) Write $\sin(\arctan x)$ as an algebraic expression in terms of x .

- A) $\sqrt{1-x^2}$ B) $\frac{x\sqrt{x^2+1}}{x^2+1}$ C) $\sqrt{1+x^2}$ D) $\frac{x\sqrt{1-x^2}}{1-x^2}$ E) NOTA

12) The function $f(x)$ satisfies the condition $f(x+1) = 2x^2 + 8x - 9$. Find $f(x-3)$.

- A) $2x^2 + 4x - 15$ B) $2x^2 - 17$ C) $2x^2 - 4x - 15$
 D) $2x^2 - 8x - 9$ E) NOTA

13) Evaluate: $\text{Cot}\left[\frac{3\pi}{4} + \text{Sin}^{-1}\left(\frac{-\sqrt{2}}{2}\right)\right]$

- A) 0 B) $\frac{\sqrt{3}}{3}$ C) $\sqrt{3}$ D) undefined E) NOTA

14) If $y = 1 + \frac{1}{x}$ for $x > 1$, then y could NOT equal which of the following?

- A) $\frac{7}{6}$ B) $\frac{15}{7}$ C) $\frac{4}{3}$ D) $\frac{23}{20}$ E) NOTA

15) If $2\sin^2\theta = \sin\theta$ has solutions $\frac{a\pi}{6}, \frac{b\pi}{6}, \frac{c\pi}{6}$ and $\frac{d\pi}{6}$ for $0 \leq \theta < 2\pi$ and $a < b < c < d$ then give the value of $b+d$.

- A) 6 B) 7 C) 12 D) 16 E) NOTA

PRECALCULUS INDIVIDUAL TEST—WANDO MATH TOURNAMENT

16) Grandma Mary Jane has 7 grandchildren, 3 of whom are boys, and 4 are girls. On a radio call-in contest, she won a trip for 4 to Hawaii. If she plans on taking 3 grandchildren along with her, and she selects the grandchildren randomly, what is the probability that she takes 2 girls and 1 boy with her to Hawaii?

- A) $\frac{9}{35}$ B) $\frac{12}{35}$ C) $\frac{18}{35}$ D) $\frac{24}{35}$ E) NOTA

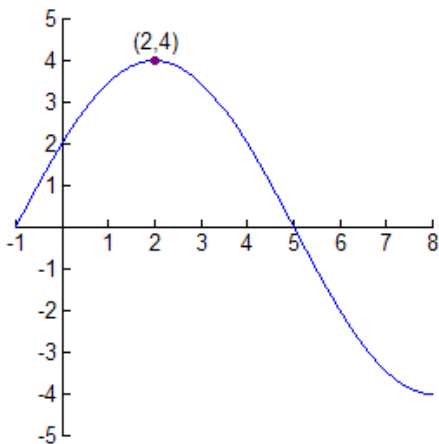
17) If $8^x - 5(8^{x-1}) = 6$, find $(6x)^x$.

- A) $\frac{4}{3}$ B) 6 C) 8 D) 12 E) NOTA

18) Triangle ABC is an isosceles right triangle with hypotenuse \overline{BC} . If $AC = \sec\theta$ and $BC = (\sqrt{3})\tan\theta$ for $0^\circ < \theta < 90^\circ$ find the value of θ to the nearest degree. (Note: θ is not an angle of $\triangle ABC$)

- A) 55 B) 35 C) 28 D) 24 E) NOTA

19) Find the value of A, given the graph of $y = A\sin\left(\frac{\pi x}{6} - \frac{\pi}{12}\right) + A\cos\left(\frac{\pi x}{6} - \frac{\pi}{12}\right)$ shown below.



- A) 2
 B) $2\sqrt{2}$
 C) 4
 D) $4\sqrt{2}$
 E) NOTA

PRECALCULUS INDIVIDUAL TEST—WANDO MATH TOURNAMENT

20) Find the solution of $\cos x + \cos^2 x = \sin^2 x$ on the interval $0 \leq x < 2\pi$.

- A) $\{\pi\}$ B) $\{\frac{\pi}{3}, \pi\}$ C) $\{\frac{\pi}{3}, \pi, \frac{5\pi}{3}\}$ D) $\{0, \frac{3\pi}{4}, \frac{7\pi}{4}\}$ E) NOTA

21) In one minute the circumference of a circle of radius 20 cm decreases by 5 cm. By what percent did the circle's area decrease in that minute?

- A) $2\pi\%$ B) $\frac{16\pi}{64\pi^2}\%$ C) $\left(400\pi - 100 + \frac{25}{4\pi}\right)\%$
 D) $\left(\frac{25}{\pi} - \frac{25}{16\pi^2}\right)\%$ E) NOTA

22) How many liters of a 70% alcohol solution need to be added to 30 liters of a 50% alcohol solution to make a 67% alcohol solution?

- A) 7.3 L B) 105.9 L C) 40.7 L D) 17 L E) NOTA

23) Which is an equivalent expression for $\log_2 3 \cdot \log_3 4 \cdot \log_4 5 \dots \log_{10} 11$?

- A) $\log_2 11$ B) $\log_{11} 2$ C) $\log 121$ D) $11(\log 2)$ E) NOTA

24) Which of the following is NOT a fourth root of 1?

- A) 1 B) -1 C) i D) -i E) NOTA

25) To the nearest hundredth of a degree, find the angle between the vectors $\langle 4, 11 \rangle$ and $\langle 17, 41 \rangle$.

- A) 2.45° B) 2.54° C) 2.67° D) 2.83° E) NOTA

PRECALCULUS INDIVIDUAL TEST—WANDO MATH TOURNAMENT

Answers

- 1) B
- 2) A
- 3) C
- 4) C
- 5) B
- 6) D
- 7) E (it is 44.5)
- 8) D
- 9) D
- 10) A
- 11) B
- 12) D
- 13) A
- 14) B
- 15) B
- 16) C
- 17) E (it is 16)
- 18) A
- 19) B
- 20) C
- 21) D
- 22) E (it is 170 L)
- 23) A
- 24) E
- 25) B