College of Charleston
Math Meet 2026
Written Test – Level 3

1. What is the tangent line to $\cos(\pi xy) + 3x + 3y - x^2 - y^2 = 5$ at the point $(2, 2)$?
   (A) $y = 2$ (B) $x + y = 4$ (C) $x + 2y = 6$
   (D) $2x + y = 6$ (E) none of these

2. For what values of x is the derivative of $f(x) = x^2$ greater than the derivative of $g(x) = x^3$?
   (A) $0 < x < \frac{2}{3}$ (B) $0 < x < 1$ (C) $-1 < x < 0$
   (D) $x > 1$ (E) $-\frac{2}{3} < x < 1$

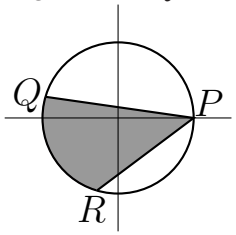
3. Consider the function $f(x) = 4 + 3x - x^2 + 2x^3$. Suppose that for some $b > 0$, the secant line between $(0, f(0))$ and $(b, f(b))$ is tangent to the graph of f at $x = 0$. What is b?
   (A) 4 (B) -2 (C) $-\frac{1}{2}$ (D) 2 (E) $\frac{1}{2}$

4. If $\tan(2x) = -\frac{3}{4}$ and $0 < x < \frac{\pi}{2}$, what's $\sin(x)$?
   (A) $\frac{3}{5}$ (B) $\frac{3}{10}$ (C) $\frac{3}{\sqrt{10}}$
   (D) $\frac{3}{\sqrt{67}}$ (E) none of these

5. The tangent line to $y = f(x)$ at $x = 0$ is $y = 6x - 3$. Compute $\lim_{h \to 0} \frac{f(3h) - f(0)}{2h}$.
   (A) $\frac{3}{2}$ (B) 4 (C) 6
   (D) 9 (E) none of these

6. Which of the following is a factor of $(x + 1)^5 + (x + 2)^5 + (x + 3)^5 + (x + 4)^5$?
   (A) $x + 1$ (B) $x + 5$ (C) $2x + 5$
   (D) $x^2 + 5$ (E) all of these are factors

7. Let P be the point $(1, 0)$. Let Q be a second-quadrant point on the circle $x^2 + y^2 = 1$. Let R be a third-quadrant point on the circle $x^2 + y^2 = 1$, so the circular arc (counter-clockwise) from Q to R has length $\dfrac{\pi}{2}$. What is the largest possible area for the region bounded by the line segment PQ, the line segment RP, and the circular arc from Q to R?



(A) $\dfrac{\pi}{2}$ (B) $\dfrac{\pi}{4}$ (C) $\dfrac{3\pi}{8}$

(D) $\dfrac{\pi}{4} + \dfrac{1}{\sqrt{2}}$ (E) none of these

8. Let $f(x) = \dfrac{2x^2 - 4x + 5}{x^2 - 2x + 1}$. Compute $f^{(4)}(3)$.

(A) $-\dfrac{51}{32}$ (B) 0 (C) $\dfrac{1}{2}$

(D) $\dfrac{45}{8}$ (E) none of these

9. If x is a real number, then $\lfloor x \rfloor$ is the largest integer that's less than or equal to x (so x rounded down), while $\lceil x \rceil$ is the smallest integer that's greater than or equal to x (so x rounded up). If n is a positive integer, which of following is the number of digits in n?

(A) $\lfloor \log_{10} n \rfloor$ (B) $\lceil \log_{10} n \rceil$ (C) $1 + \lfloor \log_{10} n \rfloor$

(D) $1 + \lceil \log_{10} n \rceil$ (E) none of these

10. Each of four people is given an identification code consisting of three (possibly repeated) capital letters. Adam gets a code in which all three letters are the same. Beth gets a code in which all three letters are different. Carl gets a code whose first letter is B. Debby gets a code that contains at least one B. Which of the following is true?

(A) Adam is the most likely to have an A in his code

(B) Beth is the most likely to have an A in her code

(C) Carl is the most likely to have an A in his code

(D) Debby is the most likely to have an A in her code

(E) Each of the four people is equally likely to have an A in their code

11. Which of the following is possible?

(A) A right triangle, all of whose side lengths are prime

(B) A right triangle, all of whose side lengths are odd

(C) A right triangle, all of whose side lengths are integers that aren't divisible by 3

(D) A right triangle, all of whose side lengths are integers that aren't divisible by 5

(E) None of these is possible

12. The students of SuperMath High School are divided into five groups: GoldenMean, ImaginaryPart, Fibonacci, AbsoluteValue, and LessOrEqual. Each pair of groups are either allies or enemies. Every group which is an ally of the enemy of some other group is also an enemy of that group. How many possible different relationships are there among the five groups?

(A) 2^{10} (B) 10 (C) 127

(D) 52 (E) None of the above

13. If a and b are prime numbers and $x^2 - ax + b = 0$ has distinct positive integral solutions, then which of the following statements is true?

(A) $a + b$ is prime (B) the difference of the solutions is even

(C) $b^2 + a$ is not prime (D) neither solution is prime

(E) none of these

14. In square $ABCD$, points E and F are the midpoints of sides AB and BC, respectively. If the length of a side of the square is x, then find the length of the altitude drawn from point E to DF.

(A) $3x/2\sqrt{5}$ (B) $3x\sqrt{2}/4$ (C) $3x\sqrt{2}/2$

(D) $x\sqrt{6}/2$ (E) none of these

15. What is $\cos\left(\frac{2\pi}{5}\right) + \cos\left(\frac{4\pi}{5}\right) + \cos\left(\frac{6\pi}{5}\right) + \cos\left(\frac{8\pi}{5}\right) + \cos\left(\frac{10\pi}{5}\right)$?

(A) $-\frac{1}{2}$ (B) 0 (C) $\frac{1}{5}$ (D) 1 (E) 2

16. If we start with a multi-digit positive integer, we could sum its digits to get a new, smaller number. If the result is still multi-digit, we could sum its digits, getting an even smaller number. Continuing this, we'll eventually get to a single-digit number. After that, summing the digits leaves us at the same number. For example, if we start with 8768, summing the digits produces 29. Summing the digits of that produces 11. Summing the digits of that produces 2. Suppose that we start with a multi-digit prime number. If we sum the digits, then sum the digits of the result, etc until we get a single-digit number, which single-digit numbers are possible results?

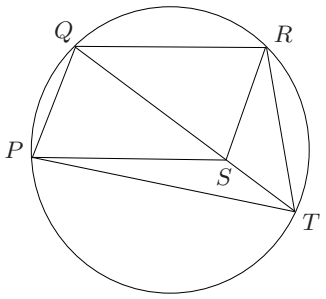
(A) $1, 2, 4, 5, 7$, and 8 (B) $2, 3, 4, 5, 7$, and 8 (C) $2, 4, 5, 6, 7$, and 8

(D) $2, 4, 5, 7, 8$, and 9 (E) $1, 2, 3, 4, 5, 7, 8$, and 9

17. How many corners does the graph of $y = \big||x| - 2\big|$ have?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

18. Vertices P, Q, and R of parallelogram $PQRS$ lie on a circle, while vertex S lies inside the circle (see diagram). Line QS intersects the circle at point T. If angle PTR is 60 degrees and angle SPT is 25 degrees, what is angle TRS in degrees?



(A) 20 (B) 25 (C) 30 (D) 35 (E) 40

19. The equation $\log_{16} x + \log_x 32 = 3$ has exactly two solutions. What is the larger of the two solutions?

(A) $\sqrt{2}$ (B) 4 (C) 64

(D) 128 (E) None of these

20. Let $x = \sqrt[3]{6\sqrt{3}+10} - \sqrt[3]{6\sqrt{3}-10}$. What is $x^3 + 6x$?

(A) $12\sqrt{3}$ (B) 8 (C) -8

(D) 20 (E) None of these

21. When $ax^{20} - bx^{11} + 2$ is divided by $x^2 - 1$, the remainder is $ax + b$. Find $a - b$.

(A) -2 (B) -1 (C) 0 (D) 1 (E) 2

22. Consider the following four equations: $2x + 3 = 4x + 1$, $(2x+3)^2 = (4x+1)^2$, $(2x+3)^3 = (4x+1)^3$, and $(x-1)(2x+3) = (x-1)(4x+1)$. Which of the following statements is true?

(A) $2x + 3 = 4x + 1$ has more real solutions than any of the other equations do

(B) $(2x+3)^2 = (4x+1)^2$ has more real solutions than any of the other equations do

(C) $(2x+3)^3 = (4x+1)^3$ has more real solutions than any of the other equations do

(D) $(x-1)(2x+3) = (x-1)(4x+1)$ has more real solutions than any of the other equations do

(E) all four equations have the same number of real solutions

23. Jane has five balls, numbered 1 through 5. For each ball, she's going to randomly choose to color it red, green, or blue. Each color is equally likely. What is the probability that she uses all three colors?

(A) $\frac{2}{3}$ (B) $\frac{16}{27}$ (C) $\frac{50}{81}$

(D) $\frac{181}{243}$ (E) None of these

24. Let C be a circle with diameter AB. Let P be a point on the circle other than A or B. What is $\angle BAP + \angle ABP$ (in degrees)?

(A) 60 (B) 90 (C) 120

(D) 135 (E) It depends on P

25. What is the probability of getting a sum of 10 when tossing three standard 6-sided dice?

(A) 1/6 (B) 1/8 (C) 1/27

(D) 5/36 (E) none of these

2026 Answers / Level 3 Test

1. B
2. A
3. E
4. C
5. D
6. C
7. D
8. D
9. C
10. B
11. E
12. D
13. A
14. A
15. B
16. A
17. D
18. D

19. E
20. D
21. A
22. B
23. C
24. B
25. B