



MONTANA COUNCIL OF TEACHERS OF MATHEMATICS
2013 MATH CONTEST
SENIOR

DIRECTIONS: DO NOT WRITE ON THIS TEST. Place the best answer for each question on the separate answer sheet.

- Find the next term in the sequence. $-3, -5, -2, 3, 5, \underline{\hspace{1cm}}$
A) 2 B) 8 C) -8 D) 3
- Write the expression as a complex number in standard form. $\frac{1-2i}{4+2i}$
A) $\frac{1}{4}$ B) $\frac{-i}{2}$ C) $1-2i$ D) $\frac{1}{4} - i$
- Find $\lim_{x \rightarrow 2} 5$. A) 10 B) 2 C) 5 D) does not exist
- Write the equation of an ellipse centered at $(0,1)$ with major axis vertices $(3,1), (-3,1)$ and minor axis vertices $(0, 3), (0,-1)$.
A) $\frac{x^2}{3} + \frac{(y-1)^2}{2} = 1$ B) $3x^2 + 2(y-1)^2 = 1$
C) $\frac{x^2}{9} + \frac{(y-1)^2}{4} = 1$ D) $\frac{x}{9} + \frac{y-1}{4} = 1$
- If $y = 3t^2 - 2$ and $x = 2t+1$ then what is $y(x)$ when $x = 5$.
A) 10 B) 11 C) 73 D) 361
- The resultant of two forces acting on a body has a magnitude of 100 lbs. The angles between the resultant and the forces are 30° and 40° . Find the magnitude of the larger force.
A) 53.2 lbs B) 62.4 lbs C) 68.4 lbs D) 86.6 lbs
- Which equation has no real solutions?
A) $x^7 + 4x = 3x^4 + 35$ B) $x^2 = -x + 3$
C) $x^4 + 13x^2 = -36$ D) $x^4 = 3x^3 + 5$
- Using a sheet of paper that is 11in. by 17in. and cutting equal squares from each corner, what is the box that can be formed by folding up the four sides?
A) 187 cubic inches B) 64 cubic inches C) 164 cubic inches D) 183 cubic inches
- Given that $A_n = \sin \frac{n\pi}{2}$ where n is an integer, find the sum of the 3rd, 4th and 5th terms.
A) 0 B) -2 C) 1 D) 2
- Simplify the expression $(3 + 2i)(3 - 2i)$.
A) $13 - 12i$ B) 5 C) $5 + 12i$ D) 13
- Determine the limit of the function $f(x) = \frac{x^2-x-20}{x+4}$ as x approaches -4 .
A) 0 B) 4 C) undefined D) -9

12. Find the radius and the coordinates of the center for a circle the circle described by the equation $x^2 - 6x + y^2 = 16$.
- A) radius is 4, center is (-3,0) B) radius is 5, center is (0,3)
 C) radius is 5, center is (3,0) D) radius is 4, center is (0,-3)
13. A farmer buys 180ft of fence. Determine the area of the largest rectangular pig pen the farmer can build if the barn is used as one side of the pen.
- A) 4050 sq. ft. B) 6075 sq. ft. C) 3600 sq. ft. D) 1519 sq. ft.
14. Determine the slope of the line described by the parametric equations $x = 3 + 2t$ and $y = 5 - 4t$.
- A) $\frac{1}{2}$ B) $\frac{-1}{2}$ C) $\frac{5}{3}$ D) -2
15. Two soccer players simultaneously kick a soccer ball. One strikes with a force of 60 newtons north, the other 80 newtons east. Find the magnitude and direction of the resultant force on the ball.
- A) 140 newtons, 36.9° east of north B) 100 newtons, 36.9° north of east
 C) 100 newtons, 53.1° north of east D) 140 newtons, 53.1° east of north
16. A taxi company in Seattle charges \$2.00 per mile or fraction of a mile plus an initial fee of \$2.50. Determine total charge to ride a taxi from the Space Needle to the Seattle Airport, a distance of 15.4 miles.
- A) \$32.50 B) \$33.30 C) \$34.50 D) \$42.00
17. Determine the x-value of the local minima for the function, $f(x) = 0.01x^3 - .5x^2 + 6x$. Round your answer to the nearest tenth.
- A) 25.0 B) 24.5 C) 25.8 D) 25.5
18. What are the parametric equations of the line that is parallel to the vector $q = 2\vec{i} - 3\vec{j}$ and goes through the point P(1,5).
- A) $x = \frac{t-1}{2}, y = \frac{-3}{2}t + \frac{13}{2}$ B) $x = 1 + 2t, y = 5 - 3t$
 C) $x = 2 + t, y = -3 + 5t$ D) $x = \frac{t-1}{2}, y = \frac{5-t}{3}$

Answer Key SENIOR 2013

1. A

2. B

3. C

4. C

5. A

6. C

7. C

8. D

9. A

10. D

11. D

12. C

13. A

14. D

15. B

16. C

17. D