Mu Alpha Theta 2008 National Convention

Theta Bowl

Question 1

Use the given the function $f(x) = 3x^3 - x^2 - 12x + 4$

A = the sum of the roots

B = the sum of the reciprocal of the roots

C = the product of the roots

D = the sum of the squares of the roots

Find $\left[\dfrac{C}{A} + 3BD \right]$

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Question 2

A = the perimeter of a regular hexagon that has an area of $54\sqrt{3}$

B = the length of the median of a trapezoid when a triangle and trapezoid have equal areas and
      equal altitudes, and the base of the triangle is 18

C = the length of the longest side of a 30-60-90 triangle whose longest side and shortest side differ
      In length by 2008 units

D = the measure in degrees of an angle when the sum of all measures of the interior angles of a
      convex polygon but that one is $2008°$

Find the value of $C - \left(A + B + D\right)$.

Amit can complete a job in 5 hours. Joe can complete the same job in 12 hours. Susan can complete the job in 6 hours. The three all work together at their own constant rate. To the nearest minute, how many **minutes** will it take them to complete the job working together?   (Round your answer to the nearest whole minute.)

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Question 4

A = the coordinates of the center of the circle $x^2 + y^2 + 10x - 16y + 53 = 0$

B = the coordinates of the focus of the parabola $x^2 + 4x - 12y + 16 = 0$

C = the length of the line segment AB

D = the **diameter** of the circle: $x^2 + y^2 - 8x + 14y + 1 = 0$

Find the **product** of C and D.

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Question 5

A = the ratio of the surface area of a sphere with radius *r* to the lateral area of a circumscribed right cylinder with radius *r*

B = the ratio of the area enclosed by a square to the area enclosed by a triangle when two pieces of wire of equal length are bent to form a square and an equilateral triangle

C = the ratio of the perimeter of a square to the perimeter of a hexagon when the ratio of the area of the square to the area of the regular hexagon is $4 : 3\sqrt{3}$

D = the volume of a cone formed when a $120°$ sector is cut out of a circular piece of tin that has a radius of 6 is then bent to form the lateral surface of a cone (The tin from the cut out sector is used to form the cone.)

Find the exact value of $A \bullet 4B \bullet \dfrac{1}{C} \bullet \dfrac{D}{\pi}$.

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Question 6

A = the number of zeroes at the end of $2008!$

B = the number of distinct positive integers that are factors of 2008

C = the greatest perfect square that is less than 2008

$$D = \frac{_{2008}C_{1474}}{_{2008}C_{534}}$$

Evaluate: $A + B + C + D$

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Question 7

A = the product of the real roots of the equation: $2\log_9 x - \dfrac{54}{\log_9 x} = 3$

$$\left(\dfrac{4}{9}\right)^{(B+6)} = \left(\dfrac{243}{32}\right)^{(3-B)}$$ $$\left(\dfrac{1}{2}\right)3^C = 4$$ $$32^D = 81$$

Find $\dfrac{5ACD}{B}$

There is a box with lots of socks. There are 6 black socks, 4 white socks, 2 red socks and 1 brown sock.
I randomly draw **two** socks from the box, without replacement.

A = the probability that I draw two black socks.

B = the probability that I draw a red sock first and then a white sock.

C = the probability that I draw one red and one black sock.

D = the probability that I draw no white socks.

Evaluate $\dfrac{A+C}{B+D}$ and write as a reduced proper fraction.

A = the length of $\overline{AC}$ when in $\triangle ACD$ an angle bisector of $\angle D$ is drawn intersecting
$\overline{AC}$ at B given that $AB = 2x - 12, BC = x, CD = x + 5, AD = 2x - 4$

B = the area of the bounded region formed by the intersection of the graphs of $y > |x|$ and
$x^2 + y^2 < 16$

C = the length from one vertex of a square with sides of length $\sqrt{5}$ to the midpoint
of a side that does not contain that vertex

D = the circumference of a circle when the radius of the circle is perpendicular to an 8 inch chord
that is 1 inch from the outer endpoint of the radius

Find the value of $A \bullet C + \dfrac{B + D}{\pi}$.

Mr. S. S. (Mr. Superman Snow) tosses a ball upward while standing atop and on the edge of a building 144 feet high. Because of his strength he tosses the ball upward with an initial velocity of 128 feet/sec. The ball travels upward and falls at the base of the building on the ground. The function, $s(t) = -16t^2 + v_0 t + h_0$ denotes the distance s(t) in feet of the ball from the ground at time (t) in seconds,   where $v_o =$ initial velocity and $h_o =$ initial height .   (Since Mr. S.S. is very short, please disregard his height in this problem.)

A = the time in seconds it takes the ball to reach its maximum height

B = the time in seconds it takes the ball to reach the ground

C = the maximum height in feet the ball reaches

Find $\sqrt{ABC}$.

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Question 11

Write the square root of the number of distinct permutations of "SACRAMENTO" in simplified

$$A\sqrt{B} \text{ form.}$$

C = the 56th term of the series: - 203 – 192 – 181 - 170 – 159 …

$$D = \sum_{i=o}^{\infty} 15\left(\frac{2}{7}\right)^i$$

Evaluate: $A - \left(\dfrac{C \bullet B}{D}\right)$

Given points A($-$8, 3) and B($-$5, 12) on the line $\overline{AB}$.

The line perpendicular to $\overline{AB}$ at point B intersects the line with the equation 4x – 5y = $-$ 12   at the point (C, D).

Find C + D

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Question 13

A = the arithmetic mean of 8, 2048, - 512 , and - 1024

B = the   + geometric mean of 8 and 2048

C = the harmonic mean of 50 and 75

Find   C(A – D)

Find the zeros of the polynomial $P(x) = x^5 + 4x^4 - 12x^3 - 34x^2 + 11x + 30$.

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Question 15

A = the determinant value of $\begin{vmatrix} 1 & 2 & -1 \\ 3 & 4 & 2 \\ -1 & -2 & 0 \end{vmatrix}$

$$\begin{pmatrix} 12 & 2 & B \\ 3 & -5 & -4 \\ -10 & 2 & 0 \end{pmatrix} = 2\begin{pmatrix} C & 1 & 4 \\ 1.5 & -2.5 & D \\ -5 & 1 & 0 \end{pmatrix}$$

Find the determinant value of $\begin{vmatrix} A & B \\ C & D \end{vmatrix}$