PRE-CALCULUS **TEAM QUESTION #1**

What value of k will make the points (4, 7), (-2, -10), and $(k, 2k + 4)$ collinear?

PRE-CALCULUS **TEAM QUESTION #2**

Suppose two money market accounts, A and B exist at a local bank. Account A yields 7.2% interest per annum and account B yields 6.5% interest per annum. $10,000 is deposited into account A on January 1, 2007 and left untouched until January 1, 2012. $8,500 is deposited into account B on January 1, 2007 and left until January 1, 2012. However, account B has $500 is added every January 1st (Jan. 1, 2008, 9, 10, 11, 12). Assuming both accounts are compounded continuously, what is the positive difference in value between the two accounts on January 1, 2012? (Note: Before subtracting A and B to find the difference, round each answer to the nearest penny. Also, during the interim calculations for the value of B each year, do NOT round at all. The only rounding is to be done at the end for the final values of A and B.)

PRE-CALCULUS **TEAM QUESTION #3**

Decompose the following polynomial (you will use the values of A, B, and C later):

$$\frac{11x^2 - 24x - 11}{x^3 - 3x^2 - x + 3} = \frac{A}{x+1} + \frac{6B}{x-1} + \frac{C}{x-3}$$

Let R = the minimum value of $f(x)$ given that $f(x) = x^2 - 2Ax + C$.

Let S = the amplitude of $g(x)$ given that $g(x) = \frac{A}{B}\cos\left(\frac{C}{A}x\right) + B$.

Let T = the coefficient of the term that contains x^2y^4 in the expansion of $(Bx + Cy)^{(A+B+C)}$

What is A + B + C + R + S + T?

PRE-CALCULUS **TEAM QUESTION #4**

Let A = the dot product of 5**i** – 2**j** + **k** and -2**i** + 6**k**.

Let B = the area enclosed by $v(x)$ and $u(x)$ given the following (Hint: the region is below $v(x)$ and above $u(x)$):

$v(x) = -|x - 10| + 10$ for $0 \le x \le 20$

$u(x) = 1$ for $0 \le x \le 20$

Let C = $\left|\begin{bmatrix} 0 & 2 & 1 \\ A & -1 & 0 \\ B & 0 & 0 \end{bmatrix}\right|$ where A and B come from the two previous parts of this question.

What is A + B + C ?

PRE-CALCULUS **TEAM QUESTION #5**

The Captain of the R.M.S. Titanic left Ireland bound for New York City with a heading of 112° (west of north) and a speed of 27 mph. After 31 hours, the captain adjusted course to try to avoid an ice field; his new heading was 161° (west of north) at a reduced speed of 12mph. He continued this course for 6.4 hours before striking the infamous iceberg that proved fatal. How far (in a straight line path) was the Titanic from the port in Ireland when it struck ice? (Note: Ignore the curvature of the earth and drifting and round your final answer to the nearest whole mile)

PRE-CALCULUS **TEAM QUESTION #6**

Let A = The slope of the line that is given parametrically by:

$$x = 3t + 4 \qquad \text{and} \qquad y = 7 - 2t$$

Let B = The probability that the sum of the face-up sides after a roll of two fair dice is less than or equal to 7.

Let C = m + n where m and n are the quadrant numbers where the sine function is positive (1, 2, 3, & 4)

Let D = $p + q$ where p and q are the quadrant numbers where the cosine function is positive (1, 2, 3, & 4)

Let E = j + k where j and k are the quadrant numbers where the tangent function is negative (1,2, 3, & 4)

What is the product of A, B, C, D, and E (i.e. A • B • C • D • E) ?

PRE-CALCULUS **TEAM QUESTION #7**

Find $(1 + \mathbf{i})^7$ in $m + n\mathbf{i}$ form. You will use m and n in other parts of this question.

Let A = The positive geometric mean of the absolute value of the roots of the equation $mx^2 + nx - 5$.

Let B = The determinant of $\begin{bmatrix} x & z \\ y & xz \end{bmatrix}$ where x, y, z is the solution set of $\begin{cases} 3x + 5y + z - 3 = 0 \\ x - y + z - 6 = 0 \\ 2x + 3y - z = 0 \end{cases}$

What is A + B to the nearest integer?

PRE-CALCULUS **TEAM QUESTION #8**

Let A = the exact value of the largest x $(0 < x < 2\pi)$ such that $\tan(3x) = 1$

Let B = the exact value of the smallest x $(0 < x < 2\pi)$ such that $5\sin(2x) = \frac{5}{2}$

What is A + B? (Leave your answer as a fractional form in terms of π)

PRE-CALCULUS **TEAM QUESTION #9**

Let $f(x) = \dfrac{3x^2 - 5x + 7}{2x + 3 - x^2}$ and $g(x) = \dfrac{5}{x^2 - 16} + 2$

It is known that $f(x)$ has 3 asymptotes of the form $\begin{cases} x = A \\ x = B \\ y = C \end{cases}$

It is known that $g(x)$ has 3 asymptotes of the form $\begin{cases} x = D \\ x = E \\ y = F \end{cases}$

What is A + B + C+ D + E + F ?

PRE-CALCULUS **TEAM QUESTION #10**

Find A + B + C (to the nearest integer) using the following information:

A = the length of the diagonal of a cube of side length 3.

B = the area of a triangle with side lengths 5 and 8 and an included angle of 47°.

C = the quadrant number (e.g. 1, 2, 3, 4) which the polar graph of $r = \cos(2\theta) + 1$ traces out between $\frac{\pi}{2} < \theta < \pi$

PRE-CALCULUS **TEAM QUESTION #11**

Find A + B given the following:

A = the value of m that will make the vectors $2\mathbf{i} - \mathbf{j} + 3\mathbf{k}$ and $m\mathbf{i} - 2\mathbf{j} + \mathbf{k}$ perpendicular.

B = the area between the graph of $y = 5 - |x|$ and the x-axis.

PRE-CALCULUS **TEAM QUESTION #12**

Find A + B + C to the nearest tenth given the following.

A = the distance from the point (5, 6, -12) to the line 4x –8y + 11 z = 2 ? (Round to the nearest tenth)

$$B = \sum_{n=1}^{100}(n-2) - \sum_{n=2}^{100}(2n)$$

C = the total number of vertical and horizontal asymptotes in the graph of $f(x) = \dfrac{4x^2 + 9x}{x^2 - 1}$

PRE-CALCULUS **TEAM QUESTION #13**

Evaluate $\displaystyle\lim_{x \to 4} \frac{x-4}{\sqrt{x}-2}$

PRE-CALCULUS **TEAM QUESTION #14**

Simplify the following expression: $2004^2 - 2003^2 + 2002^2 - 2001^2 + \ldots + 0^2$

(Note: Your answer will be a positive integer)

PRE-CALCULUS **TEAM QUESTION #15**

Find the value of $(4-4i)(\sqrt{3}-i)$ in polar form where r > 0 and 0 < theta < 360°.