Question # 1

Mu School Bowl

MAΘ 2006 National Convention

A particle moves along a line with acceleration $a = 2 + 6t$ at time t. When $t = 0$, its velocity equals 3 and it is at position $s = 2$. Let A = the position of the particle when $t = 1$.

A particle starting at rest at $t = 0$ moves along a line so that its acceleration at time t is $a = 12\ ft/sec^2$. Let B = the distance in feet that the particle covers during the first 3 seconds.

Evaluate: A – B

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Evaluate: A – B

Question # 2

Mu School Bowl

MAΘ 2006 National Convention

Let A = $\lim_{x \to 3} \frac{x-3}{x^2-2x-3}$

Let B = $\lim_{x \to \infty} \frac{4-x^2}{4x^2-x-2}$

Let C = $\lim_{x \to -\infty} \tan^{-1} x$

Let D = $\lim_{x \to \infty} \frac{3x^2+27}{x^3-27}$

Evaluate: $\frac{(AB)^D}{C}$

Question # 2

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Evaluate: $\frac{(AB)^D}{C}$

Question # 3

Mu School Bowl

MAΘ 2006 National Convention

$R = 3\cos(\frac{\pi t}{3})\hat{i} + 2\sin(\frac{\pi t}{3})\hat{j}$ is the position vector from the origin to a moving point *P(x, y)* at time *t*.

Let A = the speed of the particle at *t = 3*.
Let B = the magnitude of the particle's acceleration vector at *t = 3*.

Evaluate: A/B

Question # 3

Mu School Bowl

MAΘ 2006 National Convention

$R = 3\cos(\frac{\pi t}{3})\hat{i} + 2\sin(\frac{\pi t}{3})\hat{j}$ is the position vector from the origin to a moving point *P(x, y)* at time *t*.

Let A = the speed of the particle at *t = 3*.
Let B = the magnitude of the particle's acceleration vector at *t = 3*.

Evaluate: A/B

Question # 4

Mu School Bowl

MAΘ 2006 National Convention

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
0	2	1	5	-4
1	3	2	3	-3
2	5	3	1	-2
3	10	4	0	-1

If $K(x) = 1/g(x)$, let A = $K'(1)$

If $M(x) = f(g(x))$, let B = $M'(1)$

If $P(x) = f(x^3)$, let C = $P'(1)$

If $S(x) = f^{-1}(x)$, let D = $S'(3)$

Evaluate: ABCD

Question # 4

Mu School Bowl

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If $P(x) = f(x^3)$, let C = $P'(1)$

If $S(x) = f^{-1}(x)$, let D = $S'(3)$

Evaluate: ABCD

Question # 5

Mu School Bowl

MAΘ 2006 National Convention

A tangent drawn to the parabola $y = 4 - x^2$ at the point (1, 3) forms a right triangle with the coordinate axes. Let A = the area of the triangle.

A line is drawn through the point (1, 2) forming a right triangle with the positive x- and y- axes.
Let B = the slope of the line forming the triangle of least area.

Evaluate: AB

Question # 5

Mu School Bowl

MAΘ 2006 National Convention

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Let B = the slope of the line forming the triangle of least area.

Evaluate: AB

Question # 6

Mu School Bowl

MAΘ 2006 National Convention

Let A = the minimum value of the slope of the curve $y = x^5 + x^3 - 2x$

Let B = the x-coordinate of the point at which the tangent to the curve $y = xe^{-x}$ is horizontal

Let C = the number of inflection points of the curve $y = x^4 - 4x^2$

Let D = the maximum value of the function $f(x) = 4\sin x - 3\cos x$ on the closed interval $[\pi/2, \pi]$

Evaluate = 1/(ABCD)

Question # 6

Mu School Bowl

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Let D = the maximum value of the function $f(x) = 4\sin x - 3\cos x$ on the closed interval $[\pi/2, \pi]$

Evaluate = 1/(ABCD)

Question # 7

Mu School Bowl

MAΘ 2006 National Convention

Let A = $\int_{-3}^{3} \frac{dx}{9+x^2}$

Let B = $\int_{1}^{e} \frac{\ln x}{x} dx$

Let C = $\int_{0}^{1} xe^x dx$

Evaluate: $\frac{A}{(BC)}$

Question # 7

Mu School Bowl

MAΘ 2006 National Convention

Let A = $\int_{-3}^{3} \frac{dx}{9+x^2}$

Let B = $\int_{1}^{e} \frac{\ln x}{x} dx$

Let C = $\int_{0}^{1} xe^x dx$

Evaluate: $\frac{A}{(BC)}$

Question # 8

Mu School Bowl

MAΘ 2006 National Convention

Let A = the average value of cos(x) over the interval $[\pi/3, \pi/2]$

Let B = the average value of $\csc^2(x)$ over the interval $[\pi/6, \pi/4]$

Evaluate: A + B

Question # 8

Mu School Bowl

MAΘ 2006 National Convention

Let A = the average value of cos(x) over the interval $[\pi/3, \pi/2]$

Let B = the average value of $\csc^2(x)$ over the interval $[\pi/6, \pi/4]$

Evaluate: A + B

Question # 9

Mu School Bowl

MAΘ 2006 National Convention

Let A = the area enclosed by the ellipse with parametric equations x = 2cosθ and y = 3sinθ.

Let B = the total area bounded by the curve $y = \frac{4}{x^2 + 4}$, the x-axis, and the vertical lines x = -2 and x = 2.

Evaluate: B/A

Question # 9

Mu School Bowl

MAΘ 2006 National Convention

Let A = the area enclosed by the ellipse with parametric equations x = 2cosθ and y = 3sinθ.

Let B = the total area bounded by the curve $y = \frac{4}{x^2 + 4}$, the x-axis, and the vertical lines x = -2 and x = 2.

Evaluate: B/A

Question # 10

Mu School Bowl

MAΘ 2006 National Convention

A function f(x) satisfies the equations $f(x)f'(x) = x$ and $f(0) = 1$. f(x) is positive for all values in its domain. Let $A = f(1)$.

If $(g'(x))^2 = g(x)$ for all real x and $g(0) = 0$, $g(4) = 4$. Let $B = g(1)$.

Evaluate: AB

Question # 10

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A function f(x) satisfies the equations $f(x)f'(x) = x$ and $f(0) = 1$. f(x) is positive for all values in its domain. Let $A = f(1)$.

If $(g'(x))^2 = g(x)$ for all real x and $g(0) = 0$, $g(4) = 4$. Let $B = g(1)$.

Evaluate: AB

Question # 11

Mu School Bowl

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Let A(x) = $\ln(\sec x + \tan x)$

Let B(x) = $e^{-x}\cos 2x$

Let C(x) = $\sin^{-1} x - \sqrt{1-x^2}$

Evaluate: A′(0) + B′(0) + C′(0)

Question # 11

Mu School Bowl

MAΘ 2006 National Convention

Let A(x) = $\ln(\sec x + \tan x)$

Let B(x) = $e^{-x}\cos 2x$

Let C(x) = $\sin^{-1} x - \sqrt{1-x^2}$

Evaluate: A′(0) + B′(0) + C′(0)

Question # 12

Mu School Bowl

MAΘ 2006 National Convention

Which of the following series diverge?

(a) $\sum_{n=1}^{\infty} \frac{2}{n^2-5}$ (b) $\sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n}}$ (c) $\sum_{n=1}^{\infty} \frac{1}{10n-1}$ (d) $\sum_{n=1}^{\infty} \frac{1}{n^2+n}$

(e) $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n-1}{n+1}$ (f) $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{\ln(n+1)}$ (g) $\sum_{n=1}^{\infty} (-1)^{n=1} \frac{1}{\sqrt{n}}$ (h) $\sum_{n=1}^{\infty} \frac{n}{n^3+1}$

Question # 12

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Question # 13

Mu School Bowl

MAΘ 2006 National Convention

Let A and B equal the values of k for which the line $y = 3x + k$ is tangent to the curve $y = x^3$.

Let C and D equal the slopes of the two tangents than can be drawn from the point (3, 5) to the parabola $y = x^2$.

Evaluate: (AB)/(CD)

Question # 13

Mu School Bowl

MAΘ 2006 National Convention

Let A and B equal the values of k for which the line $y = 3x + k$ is tangent to the curve $y = x^3$.

Let C and D equal the slopes of the two tangents than can be drawn from the point (3, 5) to the parabola $y = x^2$.

Evaluate: (AB)/(CD)

Question # 14

Mu School Bowl

MAΘ 2006 National Convention

Let A = the volume of the solid created when one arch of y = sin x, bounded by the x-axis, is revolved about the x-axis.

Let B = the volume of the solid created when a trapezoid with vertices (2, 0), (2, 2), (4, 0), and (4, 4) is revolved about the x-axis.

Evaluate: A/B

Question # 14

Mu School Bowl

MAΘ 2006 National Convention

Let A = the volume of the solid created when one arch of y = sin x, bounded by the x-axis, is revolved about the x-axis.

Let B = the volume of the solid created when a trapezoid with vertices (2, 0), (2, 2), (4, 0), and (4, 4) is revolved about the x-axis.

Evaluate: A/B

Question # 15

Mu School Bowl

MAΘ 2006 National Convention

Let A = the coefficient of $(x-\frac{\pi}{4})^3$ in the Taylor series about π/4 of f(x) = cos(x).

Let B = the coefficient of x^2 in the Maclaurin series for $e^{\sin x}$.

Evaluate: B/A

Question # 15

Mu School Bowl

MAΘ 2006 National Convention

Let A = the coefficient of $(x-\frac{\pi}{4})^3$ in the Taylor series about π/4 of f(x) = cos(x).

Let B = the coefficient of x^2 in the Maclaurin series for $e^{\sin x}$.

Evaluate: B/A