Question #1   Mu School Bowl
2007 Mu Alpha Theta National Convention

Find the points on the graph of $y = \dfrac{1}{x}$ where the graph is parallel to the line $4x + 9y = 3$. Then sum all the x-coordinates of these points together with all the y-coordinates of these points to get your answer.

A coin is dropped from a height of 750 feet. The height, s (in feet), at time, t (in seconds), is given by:
$s = -16t^2 + 750.$
Let A = the average velocity on the interval [1, 3].
Let B = the instantaneous velocity when t = 3.

Find A + B

Question #3 Mu School Bowl
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Part A: As a balloon in the shape of a sphere is being blown up, the volume is increasing at the rate of 4 cu. in./second. At what rate (in inches/sec) is the radius increasing when the radius is 1 inch?

Part B: The radius of a circle is increasing at the rate of 5 in/min. At what rate is the area increasing (in inches^2/sec) when the radius is 10 inches?

Find the sum of the answers to parts A and B.

Let A = the value of the area of the region bounded by $x = y^2 - 2$ and the line $y = x$.
Let B = the value of the volume of the solid formed using the following information. The base of the solid is the circle $x^2 + y^2 = 9$ and each cross-section of the solid perpendicular to the x-axis is a square.

Find A + B

Let f be a differentiable function such that f'' is continuous and f **and** f' have the values shown in the table below and use the information
in the table to answer the problems.

x	0	1	2	3	4	5
$f(x)$	1	17	3	8	9	11
$f'(x)$	25	21	19	15	13	-2

Let A = the approximate value of $f''(x)$ at $x = 2$. (using x =1 and x = 3).

Let B = the value of $\int_0^2 xf'(x^2)dx$

Let C = the value of $\int_1^3 xf''(x)dx$ Find A + B + C

A particle moves in the xy-plane so that the position of the particle at any time t is given by
$x(t) = 2e^{3t} + e^{-7t}$ **and** $y(t) = 3e^{3t} - e^{-2t}$.

Let A = the speed of the particle at time t = 0.

Let B = $\lim\limits_{t \to \infty} \dfrac{dy}{dx}$.

Find A + B

Let f be a continuous function with the following properties. The domain of f is $-10 \le x \le 10$. The range of f is $0 < f(x) < 1$. Assuming the function behaves according to the values listed, use the table below to answer the following problems.

x	-10	-3	-2	-1	0	1	2	3	10
$f'(x)$	.000045	.045	.105	.197	.25	.197	.105	.045	.000045

Let A = the sum of all the x-coordinates of all relative and absolute maximums of f.
Let B = the sum of all the x-coordinates of all relative and absolute minimums of f.
Let C = the sum of all x-coordinates of all points of inflection of f (to the nearest whole number).

Find A + B + C

A cubic polynomial is defined by $f(x) = 4x^3 + ax^2 + bx + k$, where a, b & k are constants. The function has a local maximum at $x = -1$ and the graph of the function has a point of inflection at $x = -2$. Also, $\int_0^1 f(x)dx = 32$.

Find a + b + k

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Let A = the area of the region in the 1st quadrant bounded by $y = x^2 + 1$ **and** $y = 5$.

Let B = the area of the region between the graph of $y = 3x^2 + 2x$ **and the** $x - $**axis** from $x = 1$ **to** $x = 3$.

Let C = the area of the region between the graph of $y = \sin\left(\dfrac{x}{2}\right)$ and the x-axis from $x = 0$ **to** $x = 2\pi$.

Find A + B + C

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Let A = the value of $\dfrac{d}{dx}\displaystyle\int_2^{e^x}\ln(t)\,dt$ Let B = the value of $\dfrac{d}{dx}\displaystyle\int_e^{x^3}e^t\,dt$

Let C = the value of $\dfrac{d}{dx}\displaystyle\int_x^3 e^{\sin t}\,dt$

Find A + B + C

Let R be the region bounded by the graph of $f(x) = x^2$ **and** $g(x) = 4x - x^2$.
Let A = the volume of the solid obtained by rotating R about the x-axis.
Let B = the volume of the solid obtained by rotating R about the line x = 3.

Find A + B

Let A = the average value of $f(x) = \sqrt{x}$ on the interval [4, 9].

Let B = the average value of $f(x) = x\sqrt{25 - x^2}$ on the interval [0, 5].

Find A + B

Find the length of one arch of the cycloid $\begin{cases} x = t - \sin t \\ y = 1 - \cos t \end{cases}$

Find the area (in terms of π) enclosed by the polar graph $r = \cos 2\theta$.