

2005 Calculus Bee

Winners:

1st place: Pathikrit Bhowmick

2nd Place: John Rhoads

3rd Place: Nathan Wenneker

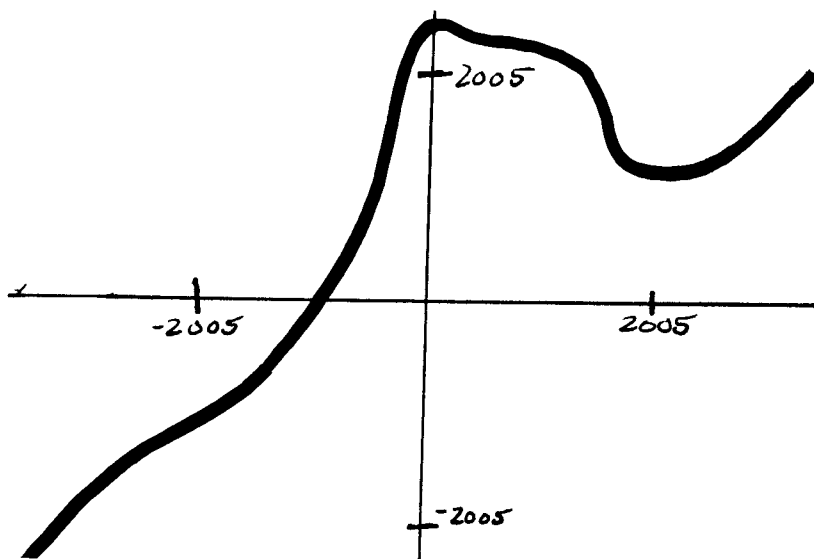
(1) Find $\int (3x + 5)^{2005} dx$.

(2) Find $\frac{d}{d\theta} (\sin^{2005}(\theta^{2005}))$.

(3) Find $\int_0^{2005} 2005^{2005} dx$.

(4) The graph of $y = g(x)$ is pictured below. Put the following four numbers in increasing order:

$2005, -2005, g(-2005), g'(-2005)$



(5) Evaluate $\int_{-2005}^{2005} (1 + xe^{x^4} \cos x) dx$.

(6) Find the area between the curves $y = x + 2$ and $y = x^2$.

(7) For which value of x is the quantity $\frac{1}{\sqrt{x^2 + 2005x + 2005^{2005}}}$ the greatest?

(8) Evaluate $\lim_{x \rightarrow 0^+} \sqrt{\frac{9}{x^2} + \frac{7}{x} - \frac{3}{x}}$.

(9) Suppose that you are given the following information about a function g :

$$g(0) = 3; g(1) = 5$$

$$g'(0) = 11; g'(1) = 31$$

$$g''(0) = 23; g''(1) = 19$$

$g''(x)$ is continuous.

Find $\int_0^1 xg''(x) dx$.

(10) For $f(x) = 1 + 3x^2 + 9x^4 + 27x^6 + \dots + 3^n x^{2n} + \dots$, express $f'(1/2)$ as a simplified fraction.