

Calculus Bee 2004

Winners:	
Kris Garrett	First Place
Ti Luu	Second Place
Ryan Dunning	Third Place

- Given the graph  $y = h(x)$ , for what integer value of  $x$  is  $h'(x)$  greatest? (graph not included here)
- Evaluate  $\int_{-\pi}^{\pi} \sin(2004x) dx$ .
- Find the derivative of  $x^{2004} 2004^x$ .
- Find an equation of the line with slope 5 which is tangent to  $y = x^2 - x$ .
- Does this series converge or diverge?  $\frac{1}{2004} + \frac{1}{4004} + \frac{1}{6004} + \frac{1}{8004} + \frac{1}{10004} + \dots$
- Find the area of the region bounded by  $y = 2004x^2$  and  $y = x^5$ . (Simplify within reason.)
- Evaluate  $\lim_{x \rightarrow \infty} \frac{\int_0^x (t^2 + 2t + 3) e^{t^3} dt}{e^{x^3}}$ .
- Evaluate  $\int \sqrt{x^7 + x^4} dx$  for  $x$  positive.
- Evaluate  $\int_{-2004}^0 \sqrt{2004^2 - t^2} dt$ .
- Find the inflection points of  $f(x) = e^{-x^2}$ . (Please give  $x$ -values only.)
- Evaluate  $\int b^x db$  for  $b$  and  $x$  positive.
- Evaluate 
$$\int \frac{2004}{x(x+1)(x+2)} dx.$$
- Evaluate  $\int x\sqrt{2x+3} dx$ .
- For what  $x$  values is the slope of the tangent line to the graph of  $y = x^3 - 3x^2 + 2x + 5$  a minimum?