2007 TCU Calculus Bee
Friday, April 27, 2007

First Place	John Rhoads
Second Place	Darren Ong
Third Place	Chris Huff

- **Problem 1:** Find $\dfrac{d}{dx}\left(x^{2007}\right)$.

- **Problem 2:** Find $\displaystyle\int_0^1 \dfrac{\ln\left(\pi^2+4\right)}{\sqrt{e^5-9}}\,dx$.

- **Problem 3:** Find $\displaystyle\int (2007x+1)^{2007}\,dx$.

- **Problem 4:** Find $\dfrac{d}{d\theta}\left(\arctan\left(2\left(\sin^2\theta+\cos^2\theta\right)^{2007}+4\right)\right)$.

- **Problem 5:** How many vertical asympotes does the graph of $y=\dfrac{x+1}{x^2-2006x-2007}$ have?

- **Problem 6:** Find $\displaystyle\int_{-\pi}^{\pi} z^{142}\sin^{57}\left(z^9\right)\,dz$.

- **Problem 7:** For $a>0$, consider the function $g(x)=\begin{cases} x & \text{if } 0\le x<a \\ 2a-x & \text{if } a\le x\le 2a \end{cases}$. Suppose that $\displaystyle\int_0^{2a} g(x)\,dx=2007$. Find a.

- **Problem 8:** Find $\displaystyle\int \ln\left(e^{7x^{45}}\right)\,dx$.

- **Problem 9:** Find the equation of the tangent line to the curve $^2-2y=x^3$ at the point $(-1,1)$.

- **Problem 10:** Does this series converge or diverge? $\displaystyle\sum_{k=2007}^{\infty} \dfrac{1}{k\ln(4k+1)}$

- **Problem 11:** Find numbers a and b so that the graph of $y=ax^3+bx^2$ has an inflection point at $(-1,1)$.

- **Problem 12:** Find $\displaystyle\int \dfrac{e^{\sqrt{s}}}{\sqrt{s}}\,ds$.

- **Problem 13:** If p is a positive integer, evaluate $\dfrac{1}{p^2}-\dfrac{1}{9p^3}+\dfrac{1}{9^2p^4}-\dfrac{1}{9^3p^5}+\ldots$

- **Problem 14:** Find $\displaystyle\lim_{n\to\infty}\left(n-\sqrt{n^2+2007n}\right)$.

- **Problem 15:** Evaluate $\displaystyle\int \dfrac{\ln x}{x^4}\,dx$.