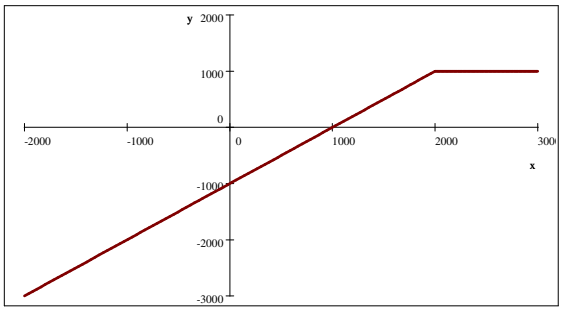
2008 Calculus Bee - April 8, 2008

First Place	Darren Ong
Second Place	John Lagrone
Third Place	Thanh Huynh

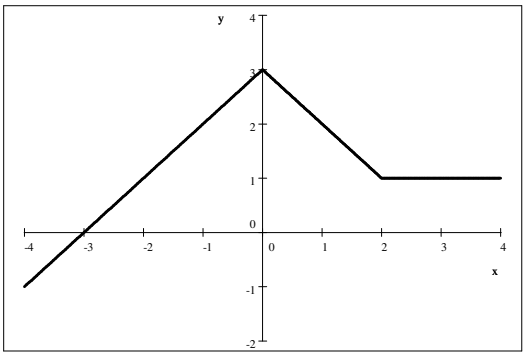
- Evaluate and simplify $\frac{d}{dx}(x^2 + x^0 + x^0 + x^8)$.
- Evaluate $\int \frac{d\theta}{\cos^2\theta}$
- Evaluate and simplify $\frac{d^{2008}}{dx^{2008}}\left(\frac{x^{2009}}{2008!}\right)$.
- Evaluate and simplify $\int_{-3}^{3} \sin(a^3)\, da$.
- Determine if the series $\sum_{n=1}^{\infty} \frac{1}{n^{2008n}}$ converges or diverges.
- For $x > 0$, find the minimum value of $(x + \frac{1}{x})^{x+\frac{1}{x}}$.
- Find $\int_0^{2008} g(x)\, dx$, if $y = g(x)$ is graphed below.



- Assume that $-\frac{\pi}{2} < x < \frac{\pi}{2}$. Evaluate and simplify $\int_0^{\tan x} \frac{2008}{1+t^2}\, dt$.
- Evaluate and simplify $\int e^{x+e^x} dx$.
- Find the point (x, y) on the graph of the function

$$f(x) = x^3 - 6x^2 + 5x + 2008$$

  where the tangent line has least slope.
- Consider the graph of $y = q'(x)$ below. Find
  - $q''(-1)$
  - $q(3) - q(-1)$.



- Find $\frac{d}{dx}\left(\int_x^0 \sin(\theta - \theta^{2008})\, d\theta\right)$.
- Find $\int_0^1 \sqrt{x^3 + 6x^2 + 9x}\ dx$.