

2016 Calculus Bee
Tuesday, April 19, 2016

1st Place	Bao Truyen Thach
2nd Place	Samuel Floren
3rd Place	Matthew Leonard

1. Evaluate

$$\frac{d}{dx} (xe^{2016+x}).$$

2. Evaluate

$$\int_0^{\infty} \frac{1}{(x+2016)^2} dx$$

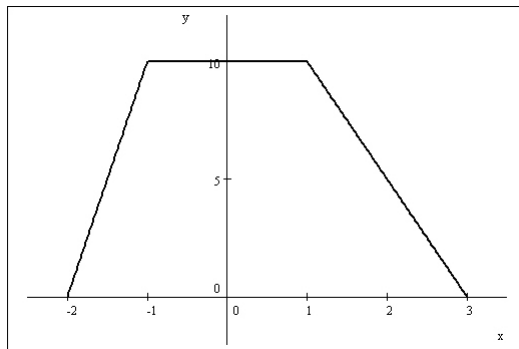
3. Find

$$\lim_{x \rightarrow 0} \frac{2 \sin^3(x)}{x(\cos(x) - 1)}.$$

4. The graph of $y = g(x)$ is pictured below. Let

$$F(x) = \int_{-2}^x g(t) dt.$$

Find $F(0) + F'(2)$.



5. Find the maximum value of

$$\varphi(x) = \sin^2 x \cos x.$$

6. Find

$$\sum_{n=1}^{\infty} \pi 2016^{-n}$$

Give your answer as a simplified fraction.

7. Determine whether or not

$$\sum_{n=2}^{\infty} \frac{1}{n \ln n}$$

converges. (Your answer should be “converges” or “diverges”.)

8. Evaluate

$$\frac{d}{dx} \sqrt{x}$$

for $x > 0$.

9. Evaluate

$$\int \left(x + \frac{1}{x + 1/x} \right) dx$$