Part 1b report

Xinyu Ma
28652703

Expansion:

$$\log(1+x) = \log\left(\frac{1+y}{1-y}\right) = \log(1+y) - \log(1-y)$$

$$\log(1+y) = y - \frac{y^2}{2} + \frac{y^3}{3} - \frac{y^4}{4} + \cdots + \frac{(-1)^{n+1} y^n}{n} + \cdots$$

$$\log(1-y) = -y - \frac{y^2}{2} - \frac{y^3}{3} - \frac{y^4}{4} - \cdots - \frac{y^n}{n} + \cdots$$

So $\log(1+x) = 2y + 0 + \frac{2y^3}{3} + 0 + \frac{2y^5}{5} + \cdots + \frac{n\%2}{n} 2y^n + \cdots$

$$\frac{1+y}{1-y} = 1+x$$

$$1+y = (1+x)(1-y)$$

$$1+y = 1-y+x-xy$$

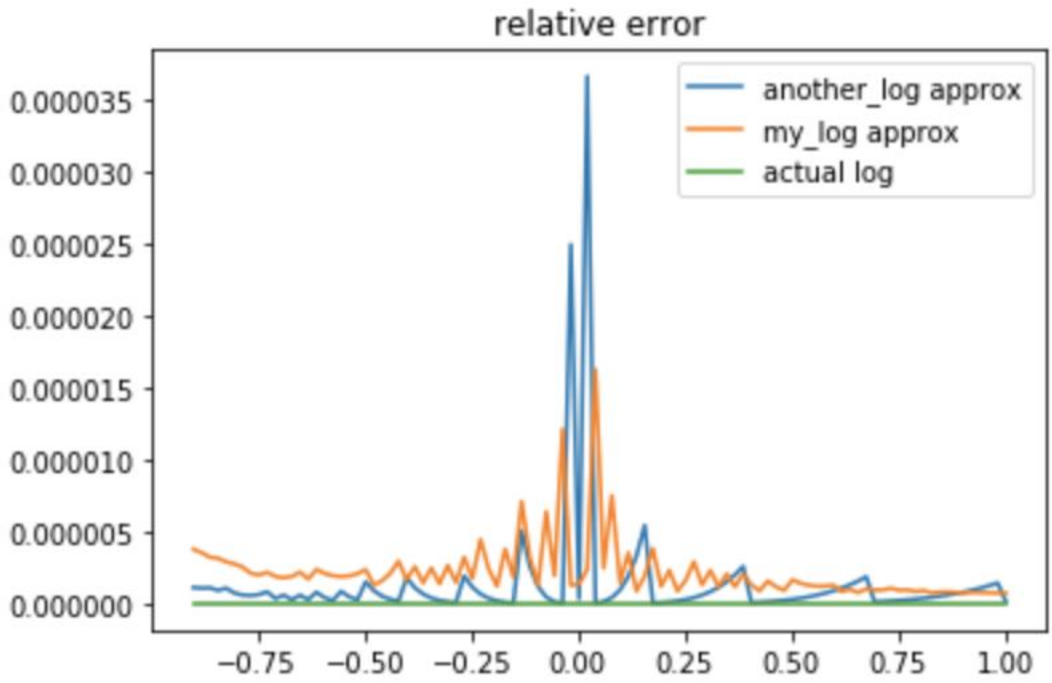
$$2y = x - xy$$

$$y(x+2) = x$$

$$y = \frac{x}{x+2}$$

Answer: $y = \frac{x}{x+2}$

$$\log(1+x) = 2y + 0 + \frac{2}{3}y^3 + 0 + \frac{2}{5}y^5 + \cdots + \frac{n\%2}{n} 2y^n + \cdots$$



When x is approaching 0, the relative error of my_another_log1p(x) is significantly higher than my_log1p(x). Overall, the relative error of my_another_log1p(x) is smaller than my_log1p(x). Compared with log_1p(x), my_another_log1p(x) also get more accurate results. I would recommend the latter.