

$$x = 3^{2008}$$

$$y = 1 + 2^2 (5^0 + 5^1 + 5^2 + 5^3 + \dots + 5^{1505})$$

$$A = 5^0 + 5^1 + 5^2 + 5^3 + \dots + 5^{1505}$$

$$5A = 5(5^0 + 5^1 + 5^2 + \dots + 5^{1504}) + 5^{1505}$$

$$5A = \underbrace{5 + 5^2 + 5^3 + \dots + 5^{1505}}_A + \underbrace{5^{1505}}_A - 1$$

$$5A = A + 5^{1506} - 1$$

$$4A = 5^{1506} - 1$$

$$A = \frac{5^{1506} - 1}{4}$$

$$y = 1 + \frac{5^{1506} - 1}{4}$$

$$y = 5^{1506}$$

$$x = 3^{2008}$$

$$y = 5^{1506}$$

$$2008 \mid 2$$

$$1004 \mid 2$$

$$502 \mid 2$$

$$251 \mid 251$$

$$2008 = 2^3 \cdot 251$$

$$1506 = 2 \cdot 3 \cdot 251$$

$$x = 3^{2 \cdot 2 \cdot 2 \cdot 251} = (3^4)^{2 \cdot 251} = 81^{502}$$

$$y = 5^{2 \cdot 3 \cdot 251} = (5^3)^{2 \cdot 251} = 125^{502}$$

$$x < y$$

