#### **EXPONENTIAL:**

## 1) CONDITION BASED EVALUATION OF EXPO EXPRESSIONS:

2007 Q1 \*

(1) If 
$$2^x \cdot 4^y = 32$$
 and  $\frac{3^x}{9^y} = 3$ , then  $\frac{5^x}{125^y} =$ 

2012 Q1 \*

(2) If 
$$\frac{2^x - 2^{-x}}{2^x + 2^{-x}} = \frac{1}{3}$$
, then  $x = \boxed{ }$ 

### 2) EXPO AS FUNCTIONS (MAXIMUM AND MINIMUM°

2012 Q2 \*\*\*

- 2. Take a point  $P(a, e^{-a})$  (a > -1) on the curve  $C : y = e^{-x}$ . Let S(a) be the area of the triangle surrounded by the tangent line to C at P, the x-axis and the y-axis.
  - Find the function S(a).

2014 Q3 \*\*

- 3. Consider the function  $y = 8^x 9 \cdot 4^x + 15 \cdot 2^x$  of  $x \ (-\infty < x < \infty)$ . Fill in the blanks with the answers to the following questions.
  - Let X denote 2<sup>x</sup>. Express y in terms of X.
  - (2) Calculate the local maximum and minimum of y, and the values of X in (1) at which y attains them.
- (3) Calculate the global maximum and minimum of y in the interval  $0 \le x \le \log_2 7$ , and the values of x at which y attains them.

(1) 
$$y =$$

## 3) EXPO AS EQUATIONS:

(2) The real-number solution to the equation 
$$2^{x+2} - 2^{-x} + 3 = 0$$
 is  $x = \begin{bmatrix} \\ \\ \end{bmatrix}$ .

#### LOGARITHMS:

### 1) EVALUATION OF LOG EXPRESSIONS:

2007 Q1 \*

(3) 
$$4 \log_2 \sqrt{2} - \frac{1}{2} \log_2 3 + \log_2 \frac{\sqrt{3}}{2} =$$

2012 Q1 \*\*

(1) If 
$$k = \frac{\log_7 9}{\log_7 4}$$
, then  $2^{5k} = \boxed{\phantom{a}}$ .

2013 Q1 \*

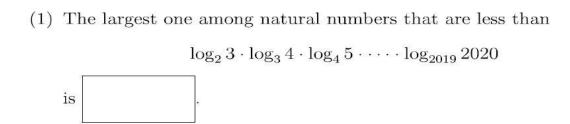
(5) If 
$$3^x = 2^y = 5$$
, then  $\frac{1}{x} + \frac{1}{y} = \log_5$ 

2015 Q1 \*

(3) If 
$$y = \log_2(x + \sqrt{x^2 + 1})$$
, then  $2^y - 2^{-y} = \boxed{x}$ .

2017 Q1 \*

(1) 
$$\log_{10} \frac{4}{5} + 2\log_{10} 5\sqrt{5} =$$



# 2) LOGARITHM AND INEQUALITIES:

2008 Q1\*

		r	1		
(3)	The solution of the inequality $\log_2(x+1) \le 3$ is {	1	< <i>x</i> ≤	2	}
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2014 Q1 \*

(4) The solution to the inequality 
$$\log_2 x + \log_2(x-2) < 4\log_{16} 8$$
, in the set of real numbers, is  $\bigcirc$   $< x < \bigcirc$ 

## 3) LOGARITHMS AND EQUATIONS:

2015 Q1 \*\*

(1) If the equation 
$$\log_{10}(ax)\log_{10}(bx) + 1 = 0$$
 with  $a > 0, b > 0$  constants has a solution  $x > 0$ , it follows that  $\frac{b}{a} \ge \boxed{0}$  or  $\boxed{2}$   $\ge \frac{b}{a} > \boxed{3}$ .

2016 Q1 \*

(1) If 
$$\log_3 6 - \log_9 x = \frac{1}{2}$$
, then  $x =$ 

4) LOGARITHMS AS FUNCTIONS:
2010 Q7 *** partial presence only
2015 Q1 **
(4) The function $f(x) = \log_2(\log_3(\log_2(\log_3(\log_2 x))))$ has the interval
x >  as its maximum domain on real numbers.



(6)	By log	$_{10} 2 \approx 0.3010$	and $\log_{10} 3 \approx 0.4771$ , th	ne number	of digits of
	$6^{100}$ is	1	, and its leading digit i	s 2	•

# 6) OTHER TYPES OF LOG EXERCISES:

2020 Q1 \*\*

2019 Q1 \*\*

(1) The largest one among natural numbers that are less than  $\log_2 3 \cdot \log_3 4 \cdot \log_4 5 \cdot \dots \cdot \log_{2019} 2020$  is

Level 1:No uknown variables, straigtforward answer, mobilizes one concept at once\*

Level 2:Inclusion of unknown variables which calls for more analysis, various condition, domains rahter than specific answers, mobilizes two to three concepts at once \*\*

Level N:When the concept has partial presence\*\*\*

Logarithms and exponentials have more presence than trigonometry, there was no presence of expo as inequalities, might appear next year,?