

Name: _____

SECONDARY MATH III HONORS
Module 2 study guide
Logarithmic functions and equations

NO CALCULATOR

1. Below you are given five different logarithmic expressions. Put these expressions in numerical order from smallest to largest by writing the *letter* that corresponds with each expression in the spaces below.

- (A) $\log_2 900$ ^{big} (B) $\log_9 9 = 1$ (C) $\log_2 0.02$ ^{negative} (D) $\log_8 1 = 0$ (E) $\log_3 27 = 3$
- _____ C _____ _____ _____ A

Smallest \longrightarrow Largest

$\ln e = \log_e e = 1$

Evaluate the following logarithms.

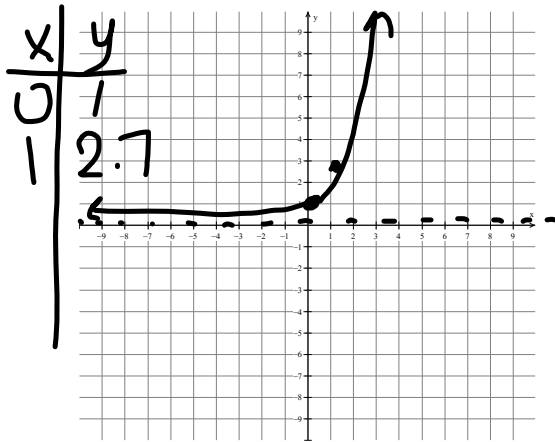
2. $\log 10,000 = 4$

3. $\log_3 \frac{1}{9} = -2$

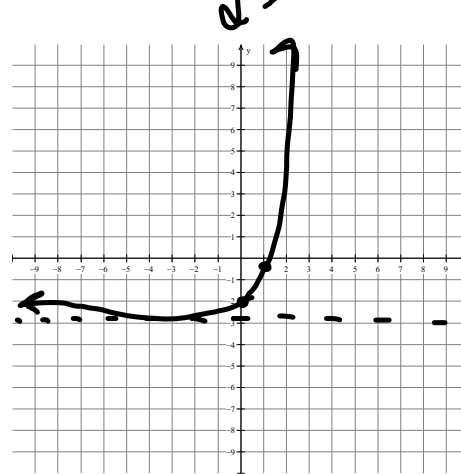
4. $\ln e^2 = 2$
 $12 \cdot \ln e$
 $12 \cdot 1 = 12$

Graph the following functions. Mark and label at least two points on each graph.

5. $f(x) = e^x$

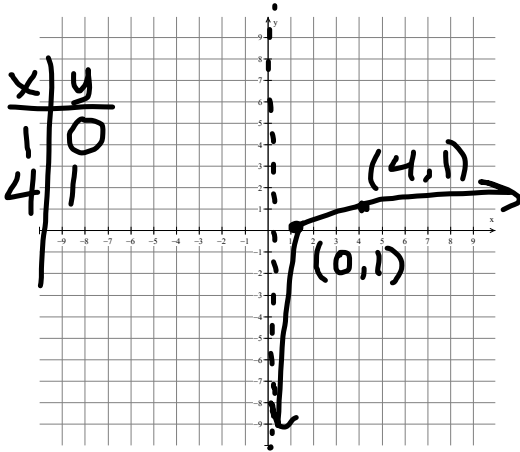


6. $f(x) = e^{x-3}$

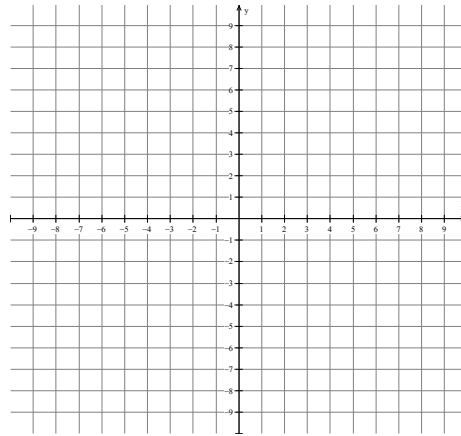


$e^{x+3} \leftarrow 3$
 $e^{x-3} \rightarrow 3$
 $e^x + 3 \uparrow 3$

7. $f(x) = \log_4 x$



8. $f(x) = \log_4(x + 2)$



Use properties of logarithms to expand each expression completely.

9. $\log_7(5x^2)$

10. $\log_2\left(\frac{3a}{5}\right)$

Use $\log_4 5 \approx 1.2$ and $\log_4 3 \approx 0.8$, along with properties of logarithms, to evaluate the following. Show all of your steps.

11. $\log_4 25$

12. $\log_4 \frac{1}{3}$

13. $\log_4 \frac{36}{5}$

$$\log_b(a)$$

$$a \neq 0 \quad a \neq \text{negative \#} \quad \text{so } a > 0$$

Find the domain, then solve the logarithmic equation. Show all of your work and discard any solutions that are not in the domain.

14. $\log_3(3x-2) - \log_3(x) = 0$

Domain:
 $3x-2 > 0$
 $x > \frac{2}{3}$

$$x > 0$$

Solve:

15. $\log_2(5x-1) - \log_2(3x-3) = 1$

Domain:

$$5x-1 > 0$$

$$x > \frac{1}{5}$$

$$3x-3 > 0$$

$$x > -1$$

Solve:

$$\log_2(5x-1) = \log_2(3x-3) + 1$$

$$5x-1 = 3x-3$$

$$2x - 1 = -3$$

$$2x = -2$$

$$x = -1 \quad \text{no solution}$$

CALCULATOR ALLOWED

Solve the exponential equation using one of the strategies learned in class. Show all of your work. Round any decimal answers to the nearest tenth.

16. $3^{4x} = \left(\frac{1}{9}\right)^{2x-8}$

$$3^{4x} = 3^{-2(2x-8)}$$

$$4x = -2(2x-8)$$

$$4x = -4x + 16$$

19. A population of Pacific white-sided dolphins grows at a rate of 1.7% per year. Currently there are 143 dolphins in the population.

$$8x = 16$$

a) Write an exponential growth formula specific to this situation.

$$x = 2$$

b) How many dolphins will there be in the population after 10 years?

c) After how many years will there be 250 dolphins?