Algebra 2 CC Name ______________________________
Logarithms Review 2020 (snow day)

Solve algebraically for all values of x, round to the ***nearest ten-thousandth***.

1.) $3^x = 11$

$x = \log_3 11$

$\boxed{x = 2.1827}$

2.) $2(5)^x = 12$

$5^x = 6$

$x = \log_5 6$

$\boxed{x = 1.1133}$

3.) $2e^x - 1 = 3$

$2e^x = 4$

$e^x = 2$

$x = \ln 2$

$\boxed{x = 0.6931}$

4.) $4 + 6e^{0.14x} = 783$

$6e^{.14x} = 779$

$e^{.14x} = \frac{779}{6}$

$.14x = \ln \frac{779}{6}$

$.14x = 4.866...$

$\boxed{x = 34.7589}$

5.) $8(2^{x+3}) = 48$

$2^{x+3} = 6$

$x + 3 = \log_2 6$

$x + 3 = 2.584...$

$\boxed{x = -0.4150}$

6.) Sean invests $8,000 at an annual rate of 4% ***compounded continuously***.

Determine how many years, to the *nearest year*, it will take for his initial investment to **triple**.

$$y = Pe^{rt}$$

$$24{,}000 = 8{,}000\, e^{.04t}$$

$$3 = e^{.04t}$$

$$.04t = \ln 3$$

$$.04t = 1.0986...$$

$$\boxed{t = 27}$$

8.) Rachel deposited $2,000 at 7% annual interest, **compounded monthly**.

In how many years, to the *nearest tenth* of a year, will she have $5,500 in her account?

$$y = a\left(1 + \frac{r}{n}\right)^{n \cdot t}$$

$$5500 = 2000\left(1 + \frac{.07}{12}\right)^{12t}$$

$$2.75 = (1.0058\bar{3})^{12t}$$

$$12t = \log_{1.0058\bar{3}} 2.75$$

$$12t = 173.922...$$

$$\boxed{t = 14.5}$$

9.) Environmentalist in Ireland ae concerned about the leprechaun population since the number of rainbows seen in a year has been steadily decreasing. Since leprechauns live at the base of rainbows, a decrease in the number of rainbows in a year will be detrimental to the survival of the leprechauns. Currently, the number of leprechauns in Ireland is 100. The number of leprechauns has been decreasing by **half** every 15 years. Find to the ***nearest tenth of a year***, when it is expected to only have 10 leprechauns remaining?

$$y = a\left(\frac{1}{2}\right)^{\frac{t}{H}}$$

$$10 = 100\left(\frac{1}{2}\right)^{\frac{t}{15}}$$

$$\frac{1}{10} = \left(\frac{1}{2}\right)^{t/15}$$

$$\frac{t}{15} = \log_{\frac{1}{2}} \frac{1}{10}$$

$$\frac{t}{15} = 3.3219\ldots$$

$$\boxed{t = 49.8}$$

10.) What is the **inverse** of the function $y = \log_4 x$?

(a) $y = x^4$ (b) $x = y^4$ (c) $y = 4^x$ (d) $x = 4^y$

11.) If $f(x) = a^x$ where $a > 1$, then the inverse of the function is

(a) $f^{-1}(x) = \log_x a$

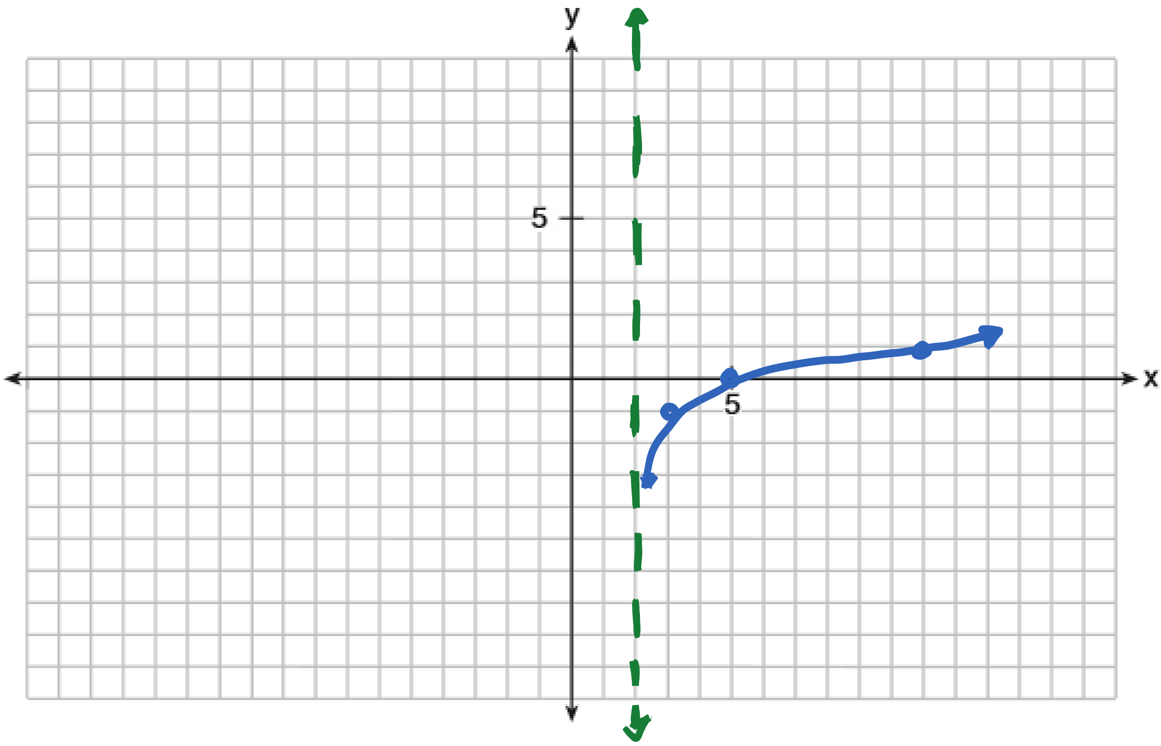
(c) $f^{-1}(x) = \log_a x$

(b) $f^{-1}(x) = a \log x$

(d) $f^{-1}(x) = x \log a$

12.) On the grid below, graph the function: $y = \log_3(x-2) - 1$

x	y
2	undefined
3	-1
5	0
11	1



b. Graph and state the equation of the asymptote.

$\boxed{x=2}$

c. State the domain of the graph.

$\boxed{(2,\infty)}$

~~13.)~~ Jeff puts $2000 in an investment account with interest that is ***compounded continuously***.

Find the annual percent of increase that is needed for the account to grow to $5000 after 20 years.

[Round to the nearest percent]

14.) The Fahrenheit temperature, $F(t)$, of a heated object at time t, in minutes, can be modeled by the function below. F_s is the surrounding temperature, F_0 is the initial temperature of the object, and k is a constant. $F(t) = F_s + (F_0 - F_s)e^{-kt}$

Coffee at a temperature of $185^\circ F$ is poured into a container. The room temperature is kept at a constant $68^\circ F$ and $k = 0.04$. Coffee is safe to drink when its temperature is, at most, $115^\circ F$. To ***the nearest minute***, how long will it take until the coffee is safe to drink?

$$115 = 68 + (185 - 68)e^{-.04t}$$

$$47 = (117)e^{-.04t}$$

$$\frac{47}{117} = e^{-.04t}$$

$$-.04t = \ln \frac{47}{117}$$

$$-.04t = -.912\ldots$$

$$t = 22.8\ldots$$

$$\boxed{t = 23}$$

15.) For which values of x, rounded to the ***nearest tenth***, will $\log(x-3) = |x| - 6$?

Intersections

(3.0, -3.0)

(6.6, 0.6)

$$\boxed{x = 3}$$

$$\boxed{x = 6.6}$$

16.) For which values of x, rounded to the ***nearest hundredth***, will $\log_4(x)+5=\left|x^2-3\right|$?

Intersections

(0.06, 3.00)

(2.96, 5.78)

$\boxed{x = 0.06}$

$\boxed{x = 2.96}$

17.) The Fahrenheit temperature, $F(t)$, of a heated object at time t, in minutes, can be modeled by the function below. F_s is the surrounding temperature, F_0 is the initial temperature of the object, and k is a constant. $F(t)=F_s+(F_0-F_s)e^{-kt}$

Coffee at a temperature of $190^\circ F$ is poured into a container. The room temperature is kept at a constant $68^\circ F$ and $k=0.06$. Coffee is safe to drink when its temperature is, at most, $120^\circ F$. To ***the nearest minute***, how long will it take until the coffee is safe to drink?

$120 = 68 + (190-68)e^{-.06t}$

$52 = (122)e^{-.06t}$

$\frac{52}{122} = e^{-.06t}$

$-.06t = \ln \frac{52}{122}$

$-.06t = -.85\ldots$

$t = 14.2\ldots$

$\boxed{t = 14}$