NAME: _____ BLOCK: ____ DATE: _____

PMATH 12 - CHAPTER 7 - PRETEST **signature**

Multiple Choice - PART 1 - NON-CALCULATOR - 10 MINUTES (#1-6)
*CIRCLE the choice that **best** completes the statement or answers the question.*

1. Which exponential function is increasing? base > 1

A. $y = \left(\frac{1}{4}\right)^x$ **B.** $y = \left(\frac{4}{3}\right)^x$ **C.** $y = 0.1^x$ **D.** $y = 0.137^x$

2. Write $\frac{1}{16}$ as a power of 4. $\frac{1}{4^2}$

A. 4^2 **B.** $4^{\frac{1}{2}}$ **C.** 4^{-2} **D.** 4^{-4}

3. Solve: $2^{x+1} = 16$ 2^4 $x+1=4$

A. $x = 3$ **B.** $x = \frac{15}{2}$ **C.** $x = -3$ **D.** $x = 15$

4. For which value of x is $y = \log_9 x$ not defined? $x > 0$

A. $x = \frac{1}{9}$ **B.** $x = 81$ **C.** $x = -9$ **D.** $x = 1$

5. Which of these expressions is NOT equal to $\log 160$?

A. $\log 80 + \log 2$ ($80 \times 2 = 160$) **B.** $\log 48 + \log 112$ (48×112) **C.** $\log 16 + \log 10$ (16×10) **D.** $\log 8 + \log 20$ (8×20)

6. Solve: $3\log 9 = \log x$ $9^3 = x$

A. $x = \frac{1}{3}$ **B.** $x = 12$ **C.** $x = 729$ **D.** $x = 27$

MULTIPLE CHOICE - PART 2 - CALULATOR may be used after 10 minutes

7. This table of values represents an exponential function. Determine the missing value.

x	y
-1	100
0	1
1	

$x^{-1} = 100$ $\left(\frac{1}{100}\right)^{-1}$ $x = \frac{1}{100} = 0.01$

A. -98 **B.** 0.01 **C.** 0.0001 **D.** 0.02

8. What is the y-intercept of the graph of $y = 4^{-4x} + 3$? $x=0,\ 4^0+3=1+3=4$

A. 1 **B.** 3 **C.** 259 **D.** 4

9. Solve: $125^{-2x} = 25^{x-24}$

A. $x = 6$ $(5^3)^{-2x} = (5^2)^{x-24}$ **C.** $x = \frac{25}{3}$

B. $x = 8$ $-6x = 2x - 48$ $-8x = -48$ **D.** $x = 3$

$x = 6$

10. Evaluate $\log_2 64$.

A. –6 **C.** 32

B. 6 $2^{\boxed{x}} = 64$ **D.** 62

11. Write this exponential expression as a logarithmic expression: $3^{\frac{2}{3}} = \sqrt[3]{9}$ (base, value) $\log_3 \sqrt[3]{9} = \frac{2}{3}$

A. $\frac{2}{3} = \log_3\left(\sqrt[3]{9}\right)$ **C.** $\frac{2}{3} = \log_{\sqrt[3]{9}}(3)$

B. $3 = \log_{\frac{2}{3}}\left(\sqrt[3]{9}\right)$ **D.** $\log_3\left(\frac{2}{3}\right) = \sqrt[3]{9}$

12. Write as a single logarithm: $4\log_3 4 - \log_3 12 + 3$ $> \log_3 3^3$

$\log_3 4^4 - \log_3 12 + 3$

$\log_3 \frac{4^4}{12} + 3$

A. $\log_3 4$ **C.** $\log_3 576$

B. $\log_3 \frac{64000}{3}$ **D.** $\log_3 7$

13. The graph of $y + 4 = \log_6(x + 8)$ is the image of the graph of $y = \log_6 x$ after it has been

-4

A. translated 8 units left and 4 units up.
B. translated 8 units right and 4 units down.
C. translated 8 units left and 4 units down.
D. translated 8 units right and 4 units up.

14. Which logarithm is equal to $\log_5(x+6) + \log_5 x$? $(x+6)(x) = x^2 + 6x$

A. $\log_5(8x)$ **B.** $\log_5\left(x^2 + 6x\right)$ **C.** $\log_5(2x+6)$ **D.** $\log_5\left(x^2 + 6x\right)$

15. What is the solution of the equation $\frac{6\left(5^{x+3}\right)}{6} = \frac{4500}{6}$?

$5^{x+3} = 750$

$\log 5^{x+3} = \log 750$

$(x+3)\log 5 = \log 750$

$x\log 5 + 3\log 5 = \log 750$

$x\log 5 = \log 750 - 3\log 5$

$x = \frac{\log 75 - 3\log 5}{\log 5}$

$x = \frac{\log 6}{\log 5}$

A. $x = \frac{\log 6}{\log 5}$ **C.** $x = \frac{\log 750}{\log 5}$

B. $x = \frac{\log 4500}{\log 30}$ **D.** $x = \log 250$

$2 \quad \frac{75}{5^3} = 6$

16. Solve: $36 = 3^x$
Give the solution to the nearest hundredth.

$\log 36 = \log 3^x$
$= x \log 3$
$\frac{\log 36}{\log 3} = x$ calculator

A. $x \doteq 1.56$
B. $x \doteq 12$
C. $x \doteq 0.31$
D. $x \doteq 3.26$

17. An account pays 5.0% annual interest, compounded semi-annually (twice a year).
What is the interest rate per compounding period, as a decimal?

5.0/2

A. 5.0 **B.** 0.025 **C.** 0.05 **D.** 2.5

18. The decibel scale measures the intensity of sound. The loudness of a sound, L decibels (dB), can be determined using the function $L = 10\log\left(\frac{I}{I_0}\right)$, where I is the intensity of the sound and I_0 is the intensity of the quietest sound that can be detected. The loudness of a library is 30 dB.
Calculate the intensity of this sound in terms of I_0.

$30 = 10\log\left(\frac{I}{I_0}\right)$
$3 = \log\left(\frac{I}{I_0}\right)$
$10^3 = \frac{I}{I_0}$

A. $10^{30} I_0$
B. $30 I_0$
C. $10^3 I_0$
D. $3 I_0$

19. Solve the equation: $3e^x = 18$. Write the solution to the nearest thousandth.

$e^x = 6$
$x = \ln 6$ calc.

A. $x \doteq 1.792$
B. $x \doteq 2.708$
C. $x \doteq 3.045$
D. $x \doteq 2.890$

20. Solve the equation: $2\ln x = \ln(3x + 18)$

$x > 0$ $x > -6$

$\ln x^2 = \ln(3x + 18)$
$x^2 = 3x + 18$
$x^2 - 3x - 18 = 0$
$(x - 6)(x + 3)$
$x = 6, -3$

A. $x = 6$
B. $x = 2$
C. $x = 9$
D. $x = 3$

Short Answer - Show your work

1. Determine whether the exponential function $y = \left(\frac{3}{4}\right)^x$ is increasing or decreasing. Explain.

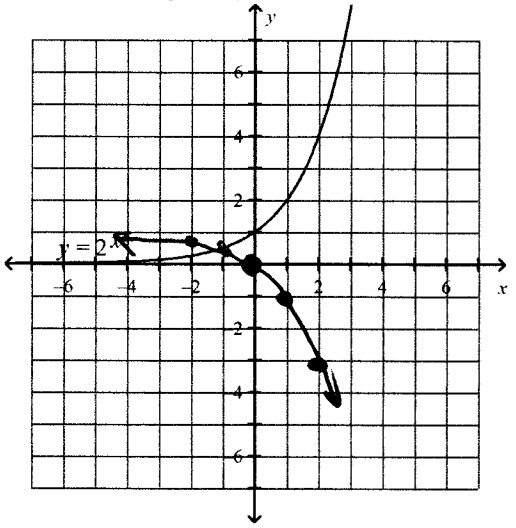
decreasing since base between 0 – 1

2. Use graphing technology to solve: $7^{x+1} = 90$. Give the solution to the nearest tenth.

$y_1 = 7 \wedge (x+1) - 90 \rightarrow$ xint ≈ 1.3

3. The graph of $y = 2^x$ is shown below.

Sketch the graph of $y = -2^x + 1$ on the same grid.



x	$y = 2^x$	$(x, -y+1)$
-2	$\frac{1}{4}$	$(-2, 3/4)$
-1	$\frac{1}{2}$	$(-1, 1/2)$
0	1	$(0, 0)$
1	2	$(1, -1)$
2	4	$(2, -3)$
-4	$\frac{1}{16}$	$(-4, 15/16)$

4. Solve: $\frac{\sqrt{27}}{9} = 3^{x-3}$ WORK

$$\frac{(3^3)^{\frac{1}{2}}}{3^2} = 3^{x-3}$$

$$3^{-\frac{1}{2}} = 3^{x-3}$$

$$-\frac{1}{2} = x - 3$$

$$-\frac{1}{2} + \frac{6}{2} = \frac{5}{2}$$

ANSWER $\boxed{5/2 = x}$

5. Evaluate: $\log_6\left(\frac{1}{216}\right)$ WORK

$$6^x = \frac{1}{216}$$

$$= \frac{1}{6^3}$$

$$= 6^{-3}$$

ANSWER $\boxed{x = -3}$

6. Write 2 as a logarithm with base 3.

$3^2 = 9 \longrightarrow \boxed{\log_3 9 = 2}$

7. Write as a single logarithm: $\frac{4}{5}\log_3 x - 3\log_3 y - 6\log_3 z$

$x^{\frac{4}{5}}$ y^3 z^6

$$\log_3\left(\frac{x^{\frac{4}{5}}}{y^3 z^6}\right)$$

8. Determine the y-intercept of the graph of $y = \log_3\left(3(x+3)\right)$. Give your answer to the nearest tenth, if necessary. $x=0$

$y = \log_3 9$

$3^y = 9$

$9 = 3^2$

$y = 2$

9. Determine whether $x = 4$ is a root of this equation.

$\log(x-9) + \log(x-6) = 1$

WORK $\log(4-9) + \log(4-6)$

$\log(-5) + \log(-2)$

ANSWER NO

10. Solve: $\log(2x-10) + \log(x-6) = \log(x-5) + \log(x-1)$

WORK $x>5$ $x>6$ $x>5$ $x>1$ $\Rightarrow$ $x>6$

$(2x-10)(x-6) = (x-5)(x-1)$

$2x^2 - 22x + 60 = x^2 - 6x + 5$

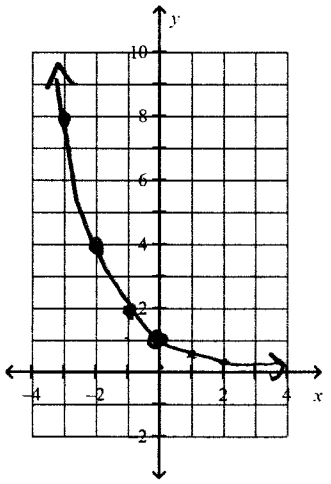
$x^2 - 16x + 55 = 0$

ANSWER $(x-11)(x-5) = 0$

$x = 11$ ~~$x = 5$~~

Problem - Show your work

1. a) Graph the exponential function $y = \left(\frac{1}{2}\right)^x$.



b) Determine:

i) whether the function is increasing or decreasing

ii) the intercepts

X-INT NONE

Y-INT 1

iii) the equation of the asymptote

hor. $y = 0$

iv) the domain of the function

$x \in R$

v) the range of the function

$y > 0$

2. Write $5(\log x - \log y)$ as a single logarithm.

$5\log x - 5\log y$

$\log x^5 - \log y^5$

$\log\left(\frac{x^5}{y^5}\right)$

OR

$5\log\left(\frac{x}{y}\right)$

$= \log\left(\frac{x}{y}\right)^5$

3. Consider the equation: $8^{x-3} = 16^{x+3}$ ——— power of 2

a) Solve this equation algebraically using logarithms.

$\log_2(2^3)^{x-3} = \log_2(2^4)^{x+3}$

$(x-3)\log_2 2^3 = (x+3)\log_2 2^4$

$(x-3)(3) = (x+3)(4)$

$3x - 9 = 4x + 12$

$-21 = x$

b) Solve this equation using common bases.

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

$3x - 9 = 4x + 12$

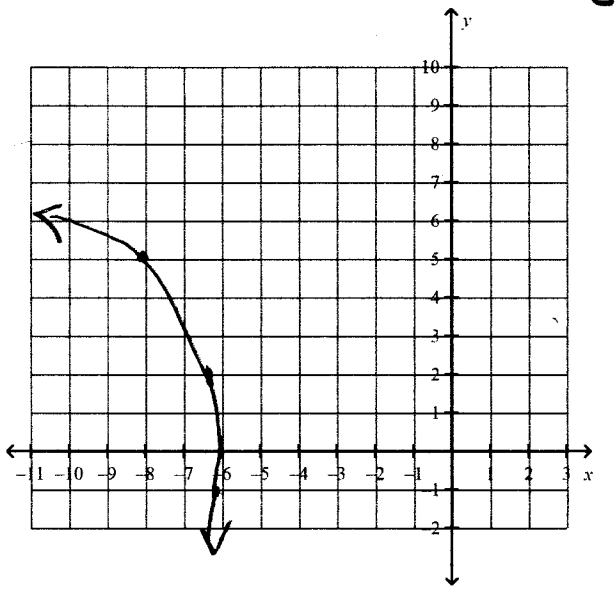
$-21 = x$

4. a) Graph $y = 3\log_6(-3(x+6)+2)$ on the grid below.

b) Identify i) the intercepts x-int ~ -6.1 y-int NONE

ii) the equations of any asymptotes $x = -6$

iii) the domain $x < -6$ and range $y \in \mathbb{R}$



$x = 6^y$	y	$\left(\frac{x}{-3} - 6,\ 3y+2\right)$
$\frac{1}{36}$	-2	$(-6\frac{1}{108}, -4)$
$\frac{1}{6}$	-1	$(-6\frac{1}{18}, -1)$
1	0	$(-6\frac{1}{3}, 2)$
6	1	$(-8, 5)$
36	2	$(-18, 8)$

5. The time, t hours, required to grow a certain bacteria in a culture beginning with 100 bacteria is:

$t = \dfrac{\ln N - \ln 100}{1.532}$, where N is the number of bacteria after t hours.

a) How much time is required to grow a culture of 200 bacteria? Round the answer to the nearest tenth.

$$t = \frac{\ln 200 - \ln 100}{1.532}$$

calculator $t \doteq 0.6$

b) How many bacteria will be in the culture in about 6 hours? Round the answer to the nearest 100. Explain your work.

$$6 = \frac{\ln N - \ln 100}{1.532}$$

$$9.192 = \ln N - \ln 100$$

$$9.192 + \ln 100 = \ln N$$

$$e^{9.192 + \ln 100} = N \quad \rightarrow (981{,}820.789\ldots)$$

$$981{,}800 = N$$