N: D: P: 1 2 3 4 5 6

Algebra 2 // **Topic 6 Test Review A** *Mission Hills Math 2013*

Directions: Calculators are not allowed.

decay → largest

1) If the equation $y = (\frac{1}{8})^x$ is graphed, which of the following values of x would produce a point closest to the x-axis?

A) $\frac{1}{8}$ = .125 B) $\frac{1}{2}$ = .5 C) $\frac{4}{3}$ = $1.\overline{33}$ D) $\boxed{\frac{5}{2} = 2.5}$

growth → smallest

2) If the equation $y = 9^x$ is graphed, which of the following values of x would produce a point closest to the x-axis?

A) $\frac{1}{7}$ B) $\frac{2}{3}$ C) $\frac{5}{4}$ D) $\frac{9}{4}$

3) Express each equation in exponential form.

A) $\log_8 \frac{1}{2} = x$ $8^x = \frac{1}{2}$ B) $\log_5 125 = 3$ $5^3 = 125$

4) Express each equation in logarithmic form.

A) $8^2 = 64$ $\log_8 64 = 2$ B) $c^y = 5$ $\log_c 5 = y$ C) $7^a = y$ $\log_7 y = a$

5) Expand each logarithm as much as possible.

A) $\log \sqrt[3]{xy}$ B) $\log(8a^5)$ C) $\ln \frac{6b^2}{x}$ D) $\log_3 \frac{x^4}{a^3 b^2}$

6) Condense each logarithm as much as possible.

A) $5\log n + \log 8$ $\log 8n^5$ B) $\log y - 3\log b$ $\log \frac{y}{b^3}$

C) $\log_6 24 - 3\log_6 2 + \log_6 c$ $\log_6 3c$ D) $2\ln k + \ln y - 4\ln a$ $\ln \frac{k^2 y}{a^4}$

7) Evaluate each of the following logarithms.

A) $\log_3 27$ 3 B) $\log_5 \frac{1}{25}$ −2 C) $\ln(e^6)$ 6 D) $\ln(e^{-2})$ −2 E) $\log_4 1$ 0

8) Express each logarithm as a quotient of common logarithms.

A) $\log_3 90$ $\frac{\log 90}{\log 3}$ B) $\log_b 25$ $\frac{\log 25}{\log b}$

9) Simplify each product as much as possible. Do not leave negative exponents in your answer.

A) $\frac{6e^x}{5e^{-3x}} \bullet \frac{e^{5x}}{12}$ $\frac{e^{9x}}{10}$ B) $\frac{2e^{-4x}}{e^{2x}} \bullet \frac{e^{-x}}{8}$ $\frac{1}{4e^{7x}}$

10) If log 2 ≈ 0.301 and log 5 ≈ 0.699, what is the approximate value of each logarithm.

A) log 10 1 B) $\log \frac{2}{5}$ −.398 C) log 20 1.301

11) If log 3 = x and log 6 = n, express each logarithm in terms of x and/or n.

A) log 2 **n − x** B) log 18 **n + x** C) log 12 **2n − x**

12) Solve each equation for x.

A) $7^x = 20$ (Express answer as a quotient of common logarithms.) $\frac{\log 20}{\log 7}$

B) $4(2^x) - 1 = 23$ (Express answer as a quotient of common logarithms.) $\frac{\log 6}{\log 2}$

C) $\frac{1}{3}e^x = 10$ (Express answer as a natural logarithm.) $\ln 30$

D) $\log_5(x-1) = 2$ (Express answer as a number.) 26

E) $\log_2(3x+4) = 3$ (Express answer as a number.) $\frac{4}{3}$

F) $\log_x \frac{1}{100} = -2$ (Express answer as a number. 10

G) $\log_2 x = -3$ (Express answer as a number.) $\frac{1}{8}$

H) $\log_6 7 + \log_6 x = 2$ (Express answer as a number.) $\frac{36}{7}$

I) $\log 4 + \log x = \log 6 + \log 2$ (Express answer as a number.) 3

J) $\log_2 x - \log_2 5 = 1$ (Express answer as a number.) 10

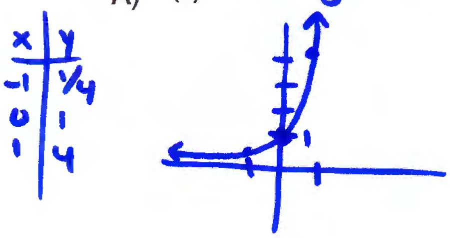
13) Which is the first ***incorrect*** step in each expansion?

A)
Step 1: $\log_4 \frac{4}{16} = \log_4 4 - \log_4 16$ ✓
Step 2: $= 1 - \log_4 16$ ✓
Step 3: $= 1 - 4$ ← No. $\log_4 16 = \underline{\underline{2}}$ not $\underline{\underline{4}}$ (Think $4^x = 16$)
Step 4: $= -3$

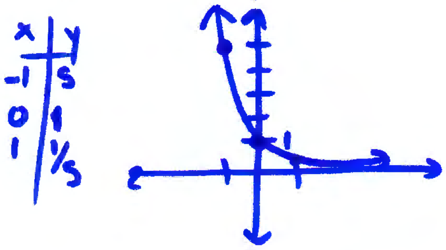
B)
Step 1: $\log \frac{7a^3}{5b^2} = \log 7a^3 - 5b^2$ ← No. should be $\log 7a^3 - \log 5b^2$
Step 2: $= \log 7 + \log a^3 - \log 5b^2$
Step 3: $= \log 7 + \log a^3 - \log 5 + \log b^2$
Step 4: $= \log 7 + 3\log a - \log 5 + 2\log b$

14) Sketch a graph of each exponential function. Your graph must have the correct key point, approach the correct asymptote, and have the correct curvature.

A) $f(x) = 4^x$ → growth



B) $y = \left(\frac{1}{5}\right)^x$ → decay



$\boxed{3}$ A) $8^x = \frac{1}{2}$ B) $5^3 = 125$

$\boxed{4}$ A) $\log_8 64 = 2$ B) $\log_c 5 = y$ C) $\log_7 y = a$

$\boxed{5}$ A) $\log \sqrt[3]{xy} = \log (xy)^{1/3}$

$= \frac{1}{3} \log xy = \frac{1}{3} \log x + \frac{1}{3} \log y$

B) $\log (8a^5) = \log 8 + \log a^5$

$= \log 8 + 5 \log a$

C) $\ln \frac{6b^2}{x} = \ln 6b^2 - \ln x$

$= \ln 6 + \ln b^2 - \ln x$

$= \ln 6 + 2 \ln b - \ln x$

D) $\log_3 \frac{x^4}{a^3 b^2} = \log_3 x^4 - \log_3 a^3 b^2$

$= \log_3 x^4 - \log_3 a^3 - \log_3 b^2$

$= 4 \log_3 x - 3 \log_3 a - 2 \log_3 b$

$\boxed{6}$ A) $5 \log n + \log 8$

$= \log n^5 + \log 8$

$= \log 8n^5$

B) $\log y - 3 \log b$

$= \log y - \log b^3$

$= \log \frac{y}{b^3}$

C) $\log_6 24 - 3 \log_6 2 + \log_6 c$

$= \log_6 24 - \log_6 2^3 + \log_6 c$

$= \log_6 \frac{24}{8} + \log_6 c$

$= \log_6 3 + \log_6 c$

$= \log_6 3c$

D) $2 \ln k + \ln y - 4 \ln a$

$= \ln k^2 + \ln y - \ln a^4$

$= \ln k^2 y - \ln a^4$

$= \ln \frac{k^2 y}{a^4}$

$\boxed{7}$ A) $\log_3 27 = 3$

B) $\log_5 \frac{1}{25} = -2$

C) $\ln(e^6) = 6 \ln e = 6$

D) $\ln(e^{-2}) = -2 \ln e = -2$

E) $\log_4 1 = 0$

8 A) $\log_3 90 = \dfrac{\log 90}{\log 3}$ B) $\log_b 25 = \dfrac{\log 25}{\log b}$

9 A) $\dfrac{6e^{x}}{5e^{-3x}} \cdot \dfrac{e^{5x}}{12} = \dfrac{6e^{6x}}{60e^{-3x}} = \dfrac{6e^{9x}}{60} = \dfrac{e^{9x}}{10}$

B) $\dfrac{2e^{-4x}}{e^{2x}} \cdot \dfrac{e^{-x}}{8} = \dfrac{2e^{-5x}}{8e^{2x}} = \dfrac{2}{8e^{7x}} = \dfrac{1}{4e^{7x}}$

$\log 2 \approx .301$ $\log 5 \approx .699$

10 A) $\log 10 = \log 2\cdot 5 = \log 2 + \log 5 = .301 + .699 = \boxed{1}$

B) $\log \frac{2}{5} = \log 2 - \log 5 = .301 - .699 = \boxed{-0.398}$

C) $\log 20 = \log 2\cdot 2\cdot 5 = \log 2 + \log 2 + \log 5 =$

$= .301 + .301 + .699 = \boxed{1.301}$

11 $\log 3 = x$ $\log 6 = n$

A) $\log 2 = \log \frac{6}{3} = \log 6 - \log 3 = \boxed{n - x}$

B) $\log 18 = \log 3\cdot 6 = \log 3 + \log 6 = \boxed{x + n}$ or $\boxed{n + x}$

C) $\log 12 = \log \frac{6\cdot 6}{3} = \log 6 + \log 6 - \log 3$

$n + n - x$

$\boxed{2n - x}$

$\boxed{12}$

A) $7^x = 20$

$\log_7 20 = x$

$\dfrac{\log 20}{\log 7}$

B) $4(2^x) - \cancel{1} = 23$

$\quad \cancel{+1} \qquad +1$

$\dfrac{\cancel{4}(2^x)}{\cancel{4}} = \dfrac{24}{4}$

$2^x = 6$

$x = \log_2 6$

$x = \dfrac{\log 6}{\log 2}$

C) $3 \cdot \frac{1}{3} e^x = 10 \cdot 3$

$e^x = 30$

$\log_e 30 = x$

$\ln 30 = x$

$x = \ln 30$

D) $\log_5(x-1) = 2$

$5^2 = x - 1$

$25 = x - \cancel{1}$

$+1 \qquad \cancel{+1}$

26

$x = 26$

E) $\log_2(3x+4) = 3$

$2^3 = 3x + 4$

$8 = 3x + \cancel{4}$

$-4 \qquad \cancel{-4}$

$\dfrac{4}{3} = \dfrac{\cancel{3}x}{\cancel{3}}$

$x = 4/3$

F) $\log_x 10^{-2} = \frac{1}{100}$

$x^{-2} = \dfrac{1}{100}$

$\dfrac{1}{x^2} = \dfrac{1}{100}$

$\hookrightarrow x = 10$

G) $\log_2 x = -3$

$2^{-3} = x$

$\dfrac{1}{2^3} = x$

$\hookrightarrow x = 1/8$

H) $\underbrace{\log_6 7 + \log_6 x}$ $= 2$

$\log_6 7x = 2$

$6^2 = 7x$

$\dfrac{36}{7} = \dfrac{\cancel{7}x}{\cancel{7}}$

$x = 36/7$

I) $\log 4 + \log x = \log 6 + \log 2$

$\log 4x = \log 12$

$\Downarrow$

$\dfrac{4x}{4} = \dfrac{12}{4}$

$\hookrightarrow x = 3$

J) $\underbrace{\log_2 x - \log_2 5}$ $= 1$

$\log_2 \dfrac{x}{5} = 1$

$\hookrightarrow 2^1 = \dfrac{x}{5}$

$2 = \dfrac{x}{5}$

$5 \cdot 2 = \dfrac{x}{\cancel{5}} \cdot \cancel{5}$

$10 = x$