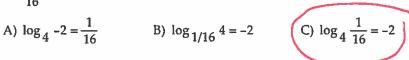## Test 3

Name _____ Solution 3/27/14

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.
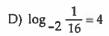
Change the exponential expression to an equivalent expression involving a logarithm.

1) $4^{-2} = \dfrac{1}{16}$                                                                  1) **C**

     A) $\log_4 -2 = \dfrac{1}{16}$       B) $\log_{1/16} 4 = -2$       C) $\log_4 \dfrac{1}{16} = -2$       D) $\log_{-2} \dfrac{1}{16} = 4$

Change the logarithmic expression to an equivalent expression involving an exponent.

2) $\log_b 49 = \dfrac{2}{3}$                                                                    2) **D**

     A) $49^{2/3} = b$       B) $b^{3/2} = 49$       C) $\left(\dfrac{2}{3}\right)^b = 49$       D) $b^{2/3} = 49$

Solve the equation.

3) $e^{x+4} = 2$                                                                       3) **C**

     A) $\{\ln 6\}$       B) $\{e^8\}$       C) $\{\ln 2 - 4\}$       D) $\{e^2 + 4\}$

Solve the equation. Express irrational answers in exact form and as a decimal rounded to 3 decimal places.

4) $\ln x + \ln (x + 4) = -4$                                                         4) **B**

     A) $\dfrac{-4 + 2\sqrt{16 + e^{-4}}}{2} \approx 2.002$           B) $\dfrac{-4 + \sqrt{16 + 4e^{-4}}}{2} \approx 0.005$

     C) $\dfrac{-4 - \sqrt{16 + 4e^{-4}}}{2} \approx -4.005$          D) $-4 + \sqrt{16 + 4e^{-4}} \approx 0.009$

Solve the problem.

5) The function $f(x) = 600(0.5)^{x/70}$ models the amount in pounds of a particular radioactive material stored in a concrete vault, where x is the number of years since the material was put into the vault. Find the amount of radioactive material in the vault after 120 years. Round to the nearest whole number.      5) **D**

     A) 514 pounds       B) 175 pounds       C) 400 pounds       D) 183 pounds

6) Three bacteria are placed in a petri dish. The population will double every day. The formula for the number of bacteria in the dish on day t is      6) **A**

$$N(t) = 3(2)^t$$

where t is the number of days after the three bacteria are placed in the dish. How many bacteria are in the dish seven days after the three bacteria are placed in the dish?

     A) 384       B) 12       C) 42       D) 147

**SHORT ANSWER.** Write the word or phrase that best completes each statement or answers the question.

**Find the domain of the function.**

7) $f(x) = \log_{10}(x^2 - 13x + 36)$

7) $\left(-\infty, 4\right) \cup \left(9, \infty\right)$

**Solve the equation.**

8) $4^{(3x-7)} = 16$

8) $X = 3$

9) $e^{x-2} = \left(\dfrac{1}{e^5}\right)^{x+6}$

9) $X = -\dfrac{14}{3}$

10) $\ln\sqrt{x+6} = 5$

10) $e^{10} - 6$

$22020.4658$

**Solve the exponential equation. Express the solution set in terms of natural logarithms.**

11) $4^{x+4} = 5^{2x+5}$

11) $X = \dfrac{5\ln 5 - 4\ln 4}{\ln 4 - 2\ln 5}$

12) $e^{3x} = 5$

12) $\dfrac{\ln 5}{3}$

**Solve the problem.**

13) **Bonus:** If $9^x = 3$, what does $9^{-2x}$ equal?

13) $\dfrac{1}{9}$

$9^x = 3$  But  $9^{-2x} = \left(9^x\right)^{-2} = (3)^{-2} = \boxed{\dfrac{1}{9}}$

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## Test 3

Name _____ Solution 3/27/14

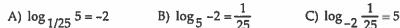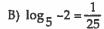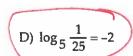**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

Change the exponential expression to an equivalent expression involving a logarithm.

1) $5^{-2} = \frac{1}{25}$

    A) $\log_{1/25} 5 = -2$    B) $\log_5 -2 = \frac{1}{25}$    C) $\log_{-2} \frac{1}{25} = 5$    D) $\log_5 \frac{1}{25} = -2$

1) __D__

Change the logarithmic expression to an equivalent expression involving an exponent.

2) $\log_b 49 = \frac{2}{3}$

    A) $49^{2/3} = b$    B) $\left(\frac{2}{3}\right)^b = 49$    C) $b^{2/3} = 49$    D) $b^{3/2} = 49$

2) __C__

Solve the equation.

3) $e^{x+8} = 5$

    A) $\{\ln 13\}$    B) $\{\ln 5 - 8\}$    C) $\{e^5 + 8\}$    D) $\{e^{40}\}$

3) __B__

Solve the equation. Express irrational answers in exact form and as a decimal rounded to 3 decimal places.

4) $\ln x + \ln(x+3) = -1$

    A) $\frac{-3 + 2\sqrt{9 + e^{-1}}}{2} \approx 1.561$        B) $-3 + \sqrt{9 + 4e^{-1}} \approx 0.236$

    C) $\frac{-3 - \sqrt{9 + 4e^{-1}}}{2} \approx -3.118$        D) $\frac{-3 + \sqrt{9 + 4e^{-1}}}{2} \approx 0.118$

4) __D__

Solve the problem.

5) Three bacteria are placed in a petri dish. The population will triple every day. The formula for the number of bacteria in the dish on day t is

$$N(t) = 3(3)^t$$

where t is the number of days after the three bacteria are placed in the dish. How many bacteria are in the dish seven days after the three bacteria are placed in the dish?

    A) 63    B) 1029    C) 6561    D) 13

5) __C__

6) The function $f(x) = 800(0.5)^{x/90}$ models the amount in pounds of a particular radioactive material stored in a concrete vault, where x is the number of years since the material was put into the vault. Find the amount of radioactive material in the vault after 110 years. Round to the nearest whole number.

    A) 327 pounds    B) 454 pounds    C) 489 pounds    D) 343 pounds

6) __D__

**SHORT ANSWER.** Write the word or phrase that best completes each statement or answers the question.

**Find the domain of the function.**

7) $f(x) = \log_{10}(x^2 - 15x + 54)$

7) $(-\infty, 6) \cup (9, \infty)$

**Solve the equation.**

8) $2^{(3x-5)} = 16$

8) $X = 3$

9) $\ln\sqrt{x+8} = 7$

9) $\left( e^{14} - 8 \right)$

$1202596.28$

10) $e^{x-6} = \left(\dfrac{1}{e^2}\right)^{x+4}$

10) $X = -\dfrac{2}{3}$

**Solve the exponential equation. Express the solution set in terms of natural logarithms.**

11) $4^{x+4} = 5^{2x+5}$

11) $X = \dfrac{5\ln 5 - 4\ln 4}{\ln 4 - 2\ln 5}$

12) $e^{4x} = 7$

12) $X = \dfrac{\ln 7}{4}$

**Solve the problem.**

13) **Bonus:** If $9^x = 4$, what does $9^{-2x}$ equal?

13) $\dfrac{1}{16}$

$$9^x = 4$$

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

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