Worksheet Six **MATH 104** Name:________________

WORK ON PROBLEMS IN GROUP OF 2-4. YOUR INSTRUCTOR WILL MARK YOUR GROUP WORK IN CLASS. TURN IN YOUR OWN WORK FOR QUESTIONS MARKED AS "INDIVIDUAL WORK" INDIVIDUALLY; UPLOAD TO CANVAS OR SUBMIT IN CLASS ON THE DUE DATE.

4.6: Exponential and Logarithmic Equations

How to Solve Many Exponential Equations in This Course

Using the Exponential Rules to simplify: If needed, use any of the rules (1) $b^x \cdot b^y = b^{x+y}$, (2) $\dfrac{b^x}{b^y} = b^{x-y}$, (3) $(b^x)^y = b^{xy}$, to create single exponential term on each side.

Setting an Equation Using the Exponents of Both Sides: Take logarithm of both sides to get an equation without any exponential terms. In this step, you will use the rule $\ln(b^x) = x\ln(b)$.

Solve for the Variable: Solve the equation from previous step.

Extraneous Solutions: Eliminate all solutions that were generated as results of our methods of solving the equation but are not solutions.

How to Solve Many Logarithmic Equations in This Course

Using the Logarithmic Rules to Simplify: If needed, use any of the rules (1) $\ln(xy) = \ln(x)+\ln(y)$, (2) $\ln\left(\dfrac{x}{y}\right) = \ln(x)-\ln(y)$, (3) $k\ln(x) = \ln\left(x^k\right)$, to create single logarithmic term on each side.

Setting an Equation Using the Exponents of Both Sides: Raise the base to power both sides to get an equation without any logarithmic terms. In this step, you will use the rule $e^{\ln(x)} = x$.

Solve for the Variable: Solve the equation from previous step.

Extraneous Solutions: Eliminate all solutions that were generated as results of our methods of solving the equation but are not solutions.

- In either types of equations, we may need to use substitution.

1. Solve

   (A) $2^{x^2+1} = 2^5$

   (B) $\log_{10}\left(\frac{x}{10}\right) = 2.$

2. Solve $\dfrac{70}{1+2e^{2t}} = 40$ for t. Watch Video.

3. Use substitution $y = e^x$ to solve $2e^{2x} + 3e^x - 9 = 0$, for x.

4. Solve $e^{3x}e^{3x} = (e^x)^x e^{-7}$ for x. Watch Gateway Video 54.

5. Solve $2^{9t+2} = 2^{t^2+16}$ for t. Watch Gateway Video 55.

6. Solve $7^{4r+2} = 7^{r^2}7^6$ for r. Watch Gateway Video 56.

7. Solve $(7^{7x})^x = (7^{49})^x$ for x. Watch Gateway Video 58.

8. Solve $\ln(7x-3) = \ln(23) + \ln(2)$ for x. Watch Gateway Video 59.

9. Solve $\ln(x+3) - \ln(x) = 1$ for x. Watch Gateway Video 60.

10. Solve $\ln(3x) + \ln\left(x - \frac{2}{3}\right) = \frac{1}{2}\ln(64)$ for x. Watch Gateway Video 63.

Worksheet Six **MATH 104** Name:____________________

INDIVIDUAL WORK

UPLOAD TO CANVAS OR SUBMIT IN CLASS BEFORE DUE DATE. DISCUSSING THESE QUESTIONS IN YOUR GROUP IS ENCOURAGED BUT MAKE SURE YOU ARE TURNING IN YOUR OWN WORK.

11. *(2 points) Solve* $\ln(x) = \ln(64) - 2\ln(x)$ *for* x. *Watch Gateway Video 61.*

12. *(2 points) Solve* $(e^{2m})^{4m} = e^{3-2m}$ *for* m. *Watch Gateway Video 57.*

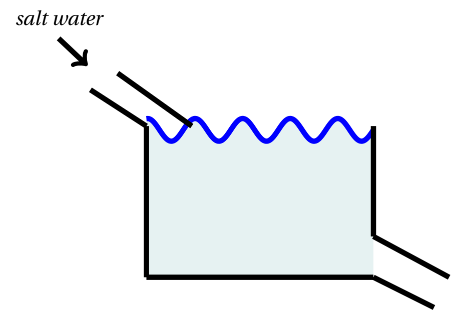
13. *Assume an exponential decay is modeled by* $A(t)$ *where* $A(t) = Ce^{rt}$, $A(0) = 50$ *and* $A(16) = 8$.

    (a) *(0.75 points) Find* C *and* r.

    (b) *(0.25 points) Find* $A(7)$.

    (c) *(0.5 points) Find the value* T *satisfying* $A(T) = 28$.

14. *A tank is filled with water. Salt water is constantly pumped into the tank and a well-mixed solution exits the tank at the same rate. The quantity of salt in the tank as a function of time is modeled by*



$$Q(t) = 190 - 170e^{-0.07t}$$

where $Q(t)$ is the amount of salt, in grams, when t minutes have passed.

Watch Similar Video.

(A) *(0.5 points) What is the initial amount of salt in the tank?*

(B) *(0.5 points) What is the amount of salt in the tank at $t = 20$ minutes?*

(C) *(0.5 points) What is the amount of salt in tank in the long run?*

(D) *(0.5 points) Does the amount of salt in the tank ever exceed the amount in Part (c)?*

(E) *(0.5 points) Does this function have an asymptote? If it does, what is it?*

Related Videos

1. Watch Gateway Video 54: https://mediahub.ku.edu/media/MATH+104+-+054/1_n17ftde6
2. Watch Gateway Video 55: https://mediahub.ku.edu/media/MATH+104+-+055/1_n1l7avu1
3. Watch Gateway Video 56: https://mediahub.ku.edu/media/MATH+104+-+056/1_phtwmzai
4. Watch Gateway Video 57: https://mediahub.ku.edu/media/MATH+104+-+057/1_xb0ylqd8
5. Watch Gateway Video 58: https://mediahub.ku.edu/media/MATH+104+-+058/1_hh7acmjz
6. Watch Gateway Video 59: https://mediahub.ku.edu/media/MATH+104+-+059/1_3fl2tbyp
7. Watch Gateway Video 60: https://mediahub.ku.edu/media/MATH+104+-+060/1_xrk6yb7y
8. Watch Gateway Video 61: https://mediahub.ku.edu/media/MATH+104+-+061/1_9vkyhxtz
9. Watch Gateway Video 62: https://mediahub.ku.edu/media/MATH+104+-+062/1_gu2tbfnj
10. Watch Gateway Video 63: https://mediahub.ku.edu/media/MATH+104+-+063/1_52unmg43