Algebra 2

Write your questions and thoughts here!

9.6 – Solve Exp & Log Eq.

Name:_____

PROPERTIES OF EQUALITY

$$b^x = b^y \text{ if and only if } x = y$$

$$\log_b x = \log_b y \text{ if and only if } x = y$$

$$b > 0, b \neq 1$$

Solve by Equating Exponents:

1. $7^{3x+4} = 49^{2x+1}$

2. $25^{2x+3} = \left(\frac{1}{5}\right)^{7x-1}$

3. $\left(\frac{1}{16}\right)^{-3m+1} = 64$

Take a logarithm of each side:

4. $4^x = 15$

5. $9 \cdot 10^{6x} = 45$

6. $5 \cdot 14^{9n+8} + 7 = 87$

Exponentiate both sides:

7. $-7 + \log_2 b = -3$

8. $\ln(x - 6) - 5 = 4$

9. $-7 \log_3(n - 10) - 5 = -12$

9.6 – Solve Exp & Log Equations

Write your questions and thoughts here!

Newton's Law of Cooling:

$$T(t) = T_s + (T_0 - T_s)e^{-kt}$$

$T(t)$ is the _____ of the object after time t.

T_s is the temperature of the _____ environment.

T_0 is the _____ temperature of the object (at time t = 0).

k is a constant that changes depending on the _____ _____ of the object.

t is the amount of _____ (in minutes) that has _____ since the object began _____.

10. Mr. Brust loves his pizza! Unfortunately, every time he takes it out of the oven, he burns his tongue because he's too impatient to wait for it to cool. If only he understood Newton's Law of Cooling! ☹ We are going to help him. We measure the room temperature to be $72°\text{F}$. The pizza is cooked at $425°\text{F}$. From the moment the pizza comes out of the oven, we wait two minutes and then measure the temperature of the pizza to be $285°\text{F}$. How long after taking the pizza out of the oven should Mr. Brust wait for the pizza to reach $120°\text{F}$? ($120°\text{F}$ is a safe temperature to eat food.)

Now summarize what you learned!

9.6 Practice – Solve Exp. And Log Equations Name: _____

Solve each equation by getting the same bases and equating exponents.

1. $16^{-3a-1} = 8$

2. $8^{3-p} = 64$

3. $\frac{16^n}{2} = 32^{5n-1}$

4. $\frac{27^x}{3} = 9^{2-x}$

5. $\left(\frac{1}{25}\right)^{2m-6} = 125^{m+1}$

6. $\left(\frac{1}{36}\right)^{-3k-3} = 216^{-3k+3}$

Solve each equation. Round your answers to three decimal places.

7. $7\log_9 m = -14$

8. $-5 + \log_{12} n = -6$

9. $e^{x-1} = 38$

10. $9^{x+7} = 61$

11. $-\log_5(-n) = -2$

12. $7^{9n} - 10 = 1$

13. $3^{x-5} = 12$

14. $2 - \log_4(w) = -2$

15. $8 - 5^{3x} = 6$

16. $\ln(x+1)=5$

17. $\ln x+1=5$

18. $-5(16)^{m-7}=-45$

19. $8\log_2(x-8)=24$

20. $1+2(8)^{n-9}=71$

21. $10-2\log_2(k-2)=4$

22. $6-4(17)^{m-10}=94$

23. $-7\log_6(-4a)+4=18$

24. $10(15)^{10r-8}-1=6$

25. $-8e^{6-3x}-8=-33$

26. $7+6\log_8(n+6)=1$

27. $-7e^{-9n-8}-9=-39$

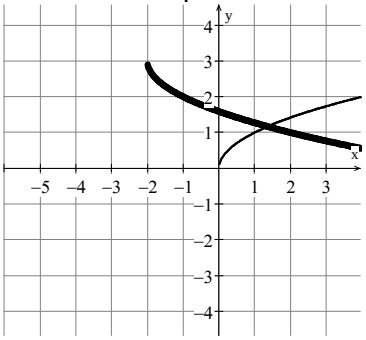
28. $8-2\ln 7n=5$

29. $-4(11)^{2x-2}+2=-37$

30. $-9\ln 10x+10=-26$

Algebra Skillz:

1. Below are graphs of $f(x) = \sqrt{x}$ (thin line) and its translation (bold line). Write an equation of the translation.



Simplify the fraction by rationalizing the denominator.

2. $\frac{3}{\sqrt{2}}$

3. $\frac{4}{3\sqrt{6}}$

Solve by factoring.

4. $2x^3 + 18x^2 + 40x = 0$

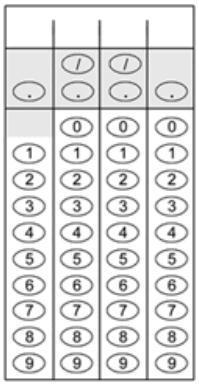
5. $9x^2 - 30x + 9 = 0$

SAT Prep:

1. Simplify: $(3^{x-2})(3^{3x+1})$

(A) $(3)^{4x-1}$
(B) $(3)^{3x^2-5x-2}$
(C) $(9)^{4x-1}$
(D) $(9)^{3x^2-5x-2}$

2. If $f(x) = 21(3)^{x+4}$, find $f(-6)$.



9.6 Application and Extension

1. Solve.

a. $-3 + \log_7(n-3) = -2$

b. $8^{a-9} - 3 = 43$

2. The Richter Scale measures the strength of earthquakes with the formula: $M = \frac{2}{3}\log\frac{E}{10^{4.4}}$, where M is the magnitude and E is the amount of energy in joules released by the earthquake.

a. The tsunami earthquake in Japan on March 11, 2011 measured 8.9 on the Richter Scale. How much energy was released?

b. How many joules does an earthquake release in order to get a "zero" on the Richter Scale?

3. You cooked some yummy ramen noodles in the microwave at lunch, but lost the directions for how long to wait before it's safe to eat! You know the room temperature is $75°\text{F}$ and the noodles are $205°\text{F}$ when they're finished cooking. If you know the constant k of the noodles is 0.6561, how long will it take for the noodles to reach $110°\text{F}$? (t is measured in minutes.)

For 4 – 6, use the following formulas:

Compounding Interest (continuous compounding)	Compounding Interest (periodic compounding)	% increase/decrease per unit of time
$A(t) = Pe^{rt}$	$A(t) = P\left(1 + \frac{r}{n}\right)^{nt}$	$f(x) = ab^x$
4. You deposit 5 cents ($0.05) into an account that pays 12% interest ***compounded continuously***. How long will it take that nickel becomes $100?	5. You deposit $1000 in an account that pays 5% annual interest ***compounded quarterly***. How long will it take for the balance to reach $50,000?	6. Mr. Brust's Ranch in Wyoming is worth $450,000 and is increasing in value by 2.7% per year. How long until it is worth $1 million?

7. Your mom asked you to turn the iron off after ironing one of your shirts. When you turn it off, the iron is $190°\text{F}$ and the room temperature is $64°\text{F}$. After waiting 60 seconds, you find the temperature of the iron has cooled down to $150°\text{F}$. How long will it take for the iron to cool down to $90°\text{F}$.