Warm-up

Monday, April 20, 2015

1. Convert to the opposite form: $x^2 = 144$

2. Convert to the opposite form: $Log_7 x = 2$

3. Condense the statement

$$\log 3x + logy - 2logz - logp$$

4. Expand $log_3(\frac{xy}{z})$

10
9
8
7
6
5
4
3
2
1

Warm-up

Monday, April 20, 2015

1. Find the roots of $2x^4 + 3x^3 - 21x^2 + 2x + 24$

2. Is $(x + 6)$ factor of $f(x) = 2x^4 - 5x^2 + 12$?
How do you know?

3. Evaluate $\log_3 16$

10
9
8
7
6
5
4
3
2
1

Objectives

Use properties of logarithms and exponential functions to solve equations.

Homework

WBP 203: 1-31 odd
33-53, odd and 54

Homework Review…

Write each expression as a single logarithm.

1. $\log_5 4 + \log_5 3$
   $\log_5 12$

2. $\log_6 25 - \log_6 5$
   $\log_6 5$

3. $\log_2 4 + \log_2 2 - \log_2 8$
   $\log_2 1$

4. $5 \log_7 x - 2 \log_7 x$
   $\log_7 x^3$

5. $\log_4 60 - \log_4 4 + \log_4 x$
   $\log_4 15x$

6. $\log 7 - \log 3 + \log 6$
   $\log 14$

7. $2 \log x - 3 \log y$
   $\log \frac{x^2}{y^3}$

8. $\frac{1}{2} \log r + \frac{1}{3} \log s - \frac{1}{4} \log t$
   $\log \frac{r^{\frac{1}{2}} s^{\frac{1}{3}}}{t^{\frac{1}{4}}}$

9. $\log_3 4x + 2 \log_3 5y$
   $\log_3 100xy^2$

10. $5 \log 2 - 2 \log 2$
    $\log 8$

11. $\frac{1}{3} \log 3x + \frac{2}{3} \log 3x$
    $\log 3x$

12. $2 \log 4 + \log 2 + \log 2$
    $\log 64$

13. $(\log 3 - \log 4) - \log 2$
    $\log \frac{3}{8}$

14. $5 \log x + 3 \log x^2$
    $\log x^{11}$

15. $\log_6 3 - \log_6 6$
    $\log_6 \frac{1}{2}$

16. $\log 2 + \log 4 - \log 7$
    $\log \frac{8}{7}$

17. $\log_3 2x - 5 \log_3 y$
    $\log_3 \frac{2x}{y^5}$

18. $\frac{1}{3}(\log_2 x - \log_2 y)$
    $\log_2 \frac{x^{\frac{1}{3}}}{y^{\frac{1}{3}}}$

19. $\frac{1}{2} \log x + \frac{1}{3} \log y - 2 \log z$
    $\log \frac{x^{\frac{1}{2}} y^{\frac{1}{3}}}{z^2}$

20. $3(4 \log t^2)$
    $\log t^{24}$

21. $\log_5 y - 4(\log_5 r + 2 \log_5 t)$
    $\log_5 \frac{y}{r^4 t^8}$

Homework Review…

Expand each logarithm. Simplify if possible.

22. $\log xyz$

$\log x + \log y + \log z$

23. $\log_2 \frac{x}{yz}$

$\log_2 x - \log_2 y - \log_2 z$

24. $\log 6x^3y$

$\log 6 + 3 \log x + \log y$

25. $\log 7(3x - 2)^2$

$\log 7 + 2 \log (3x - 2)$

26. $\log \sqrt{\frac{2rst}{5w}}$

$\frac{1}{2}\log 2 + \frac{1}{2}\log r + \frac{1}{2}\log s + \frac{1}{2}\log t - \frac{1}{2}\log 5 - \frac{1}{2}\log w$

27. $\log \frac{5x}{4y}$

$\log 5 + \log x - \log 4 - \log y$

28. $\log_5 5x^{-5}$

$\log_5 5 - 5 \log_5 x$, or $1 - 5 \log_5 x$

29. $\log \frac{2x^2y}{3k^3}$

$\log 2 + 2 \log x + \log y - \log 3 - 3 \log k$

30. $\log_4 (3xyz)^2$

$2 \log_4 3 + 2 \log_4 x + 2 \log_4 y + 2 \log_4 z$

Use the Change of Base Formula to evaluate each expression. Round your answer to the nearest thousandth.

31. $\log_4 32$ 2.5

32. $\log_3 5$ 1.465

33. $\log_2 15$ 3.907

34. $\log_6 17$ 1.581

35. $\log_6 10$ 1.285

36. $\log_5 6$ 1.113

37. $\log_8 1$ 0

38. $\log_9 11$ 1.091

What does an exponential function look like?

An example: $f(x) = 2^{x-2} + 4$

So basically any function with a variable in the exponent.

What does a logarithmic function look like?

An example: $g(x) = 3log(7x - 1) - 1$

So basically any function with a log in it.

So how do we solve an exponential equation?

Solve the following equation for x.

$8^{2x} = 32$ One method…

$\log_8 32 = 2x$ Rewrite in log form

$5/3 = 2x$ Solve the right side on your calculator

$5/6 = x$ Solve the equation using your vast algebra skills

Solve the following equation.

$$36^{-2x+1} = 216$$

Another method...

$$\log(36^{-2x+1}) = \log(216)$$

Take the log of both sides

$$(-2x+1)\log(36) = \log(216)$$

Use the properties of logs to move exponent.

$$-2x + 1 = \frac{\log(216)}{\log(36)}$$

Divide both sides by log(36).

$$-2x + 1 = 1.5$$

Evaluate the right side on your calculator.

$$x = -.25$$

Use your algebra skills to solve for x.

$$3.)\ 2x\ log(9) = log(27)$$

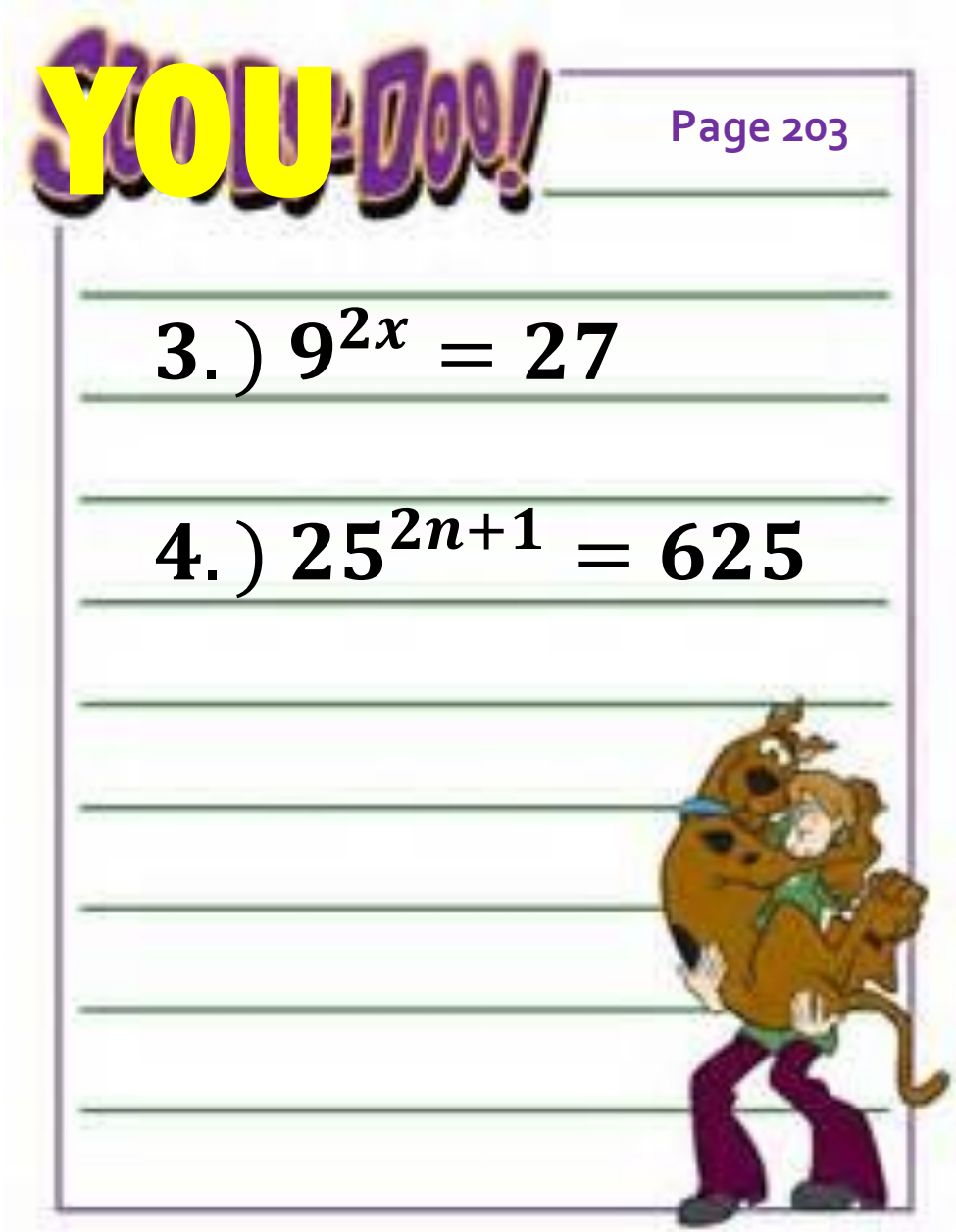
$$2x = \frac{log(27)}{log(9)}$$

$$x = 0.75$$

$$4.)\ (2n+1)\ log(25) = log(625)$$

$$2x + 1 = \frac{log(625)}{log(25)}$$

$$x = 0.5$$



What if we start with a log equation?

$$\log 4x = -1$$

$$10^{-1} = 4x$$

Not a problem, put in exponential form

$$\frac{1}{10} = 4x$$

Solve the equation using your vast algebra skills

$$0.1 = 4x$$

$$0.025 = x$$

Solve the following equation.

Yikes the variable in the log is nasty!

$$\log(2x + 5) = 4$$

Not a problem, follow the same process.

$$10^4 = 2x + 5$$

Put in exponential form

$$\frac{10^4 - 5}{2} = x$$

Use your algebra skills!

$$4997.5 = x$$

$$34.)\ 10^2 = 3x$$

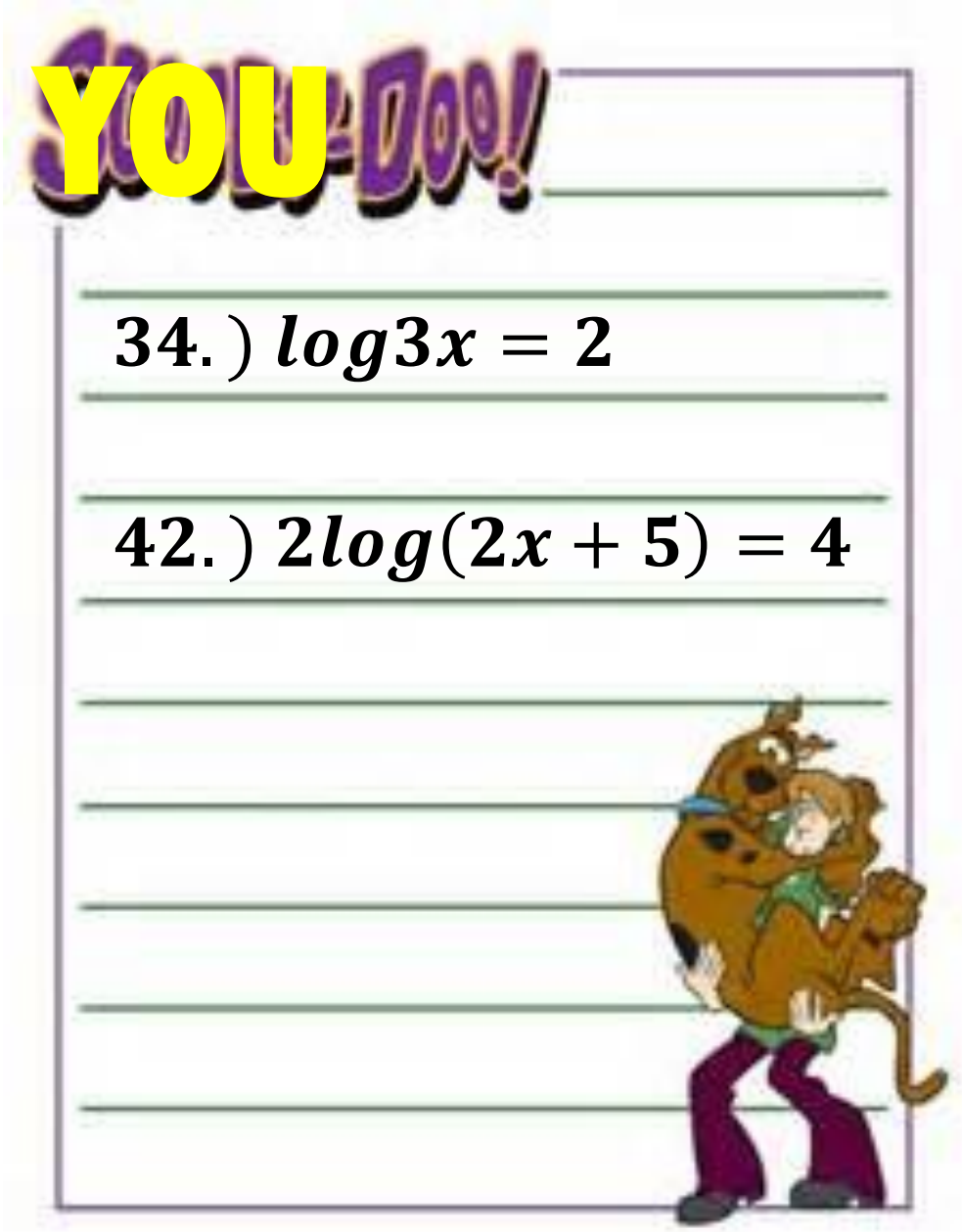
$$\frac{100}{3} = x$$

$$33\frac{1}{3} = x$$

$$42.)\ 10^2 = 2x + 5$$

$$\frac{100 - 5}{2} = x$$

$$47.5 = x$$



What about something like this? What properties of logs could you use to solve this equation?

$$log x - log 4 = 3$$

$$\log\left(\frac{x}{4}\right) = 3$$

Combine into single log statement on the left side.

$$10^3 = \frac{x}{4}$$

Rewrite in exponential form.

$$4000 = x$$

Solve for x.

$$52.)\ log x(x+21) = 2$$

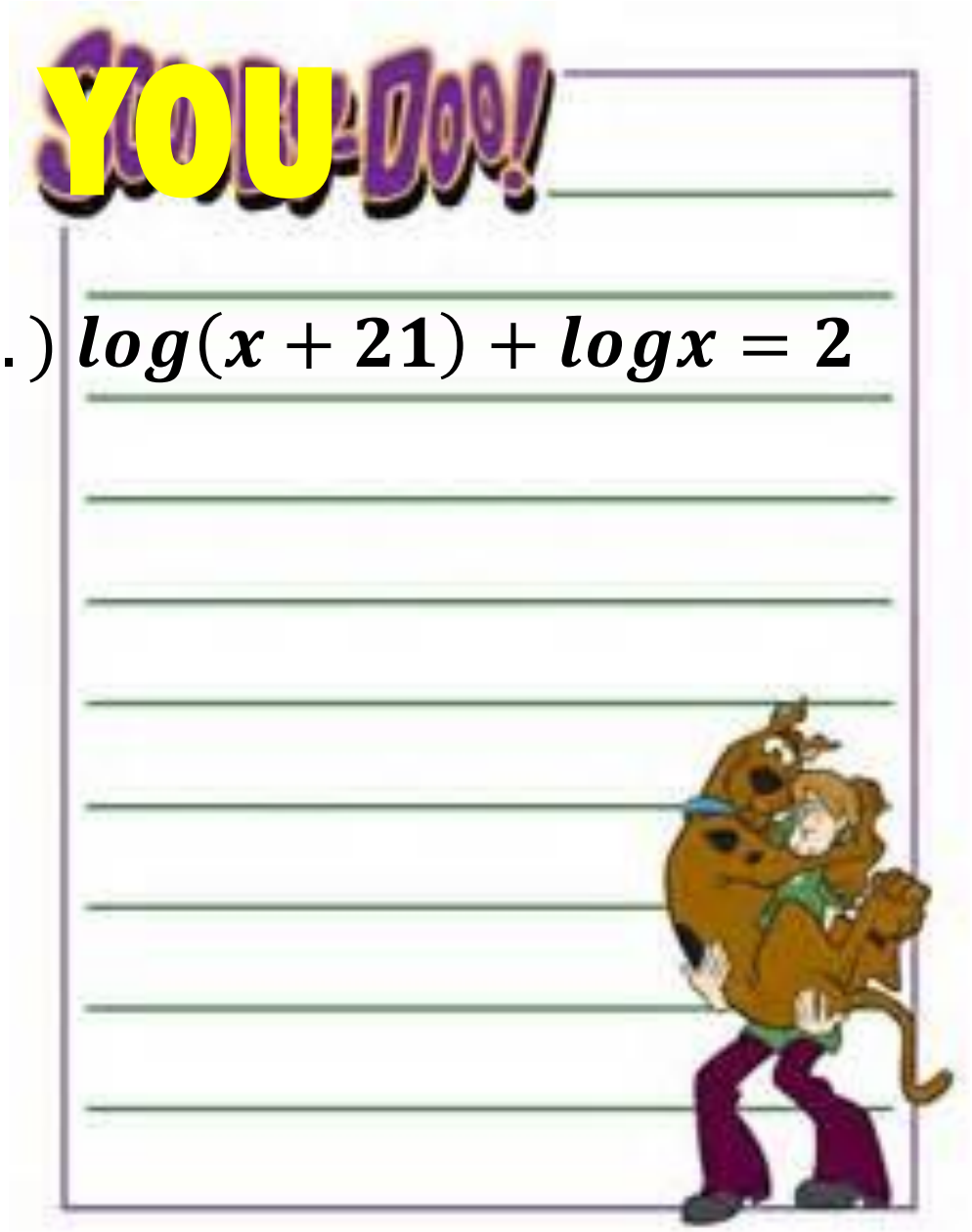
$$x(x+21) = 10^2$$

$$x^2 + 21x - 100 = 0$$

$$(x+25)(x-4) = 0$$

$$x = -25, \qquad x = 4$$

Remember you can't take the log of a negative number so $x = 4$ is the only valid solution.



55. Suppose you deposit $2500 in a savings account that pays you 5% interest per year.

a. How many years will it take you to double your money?

$$A(t) = 2{,}500(1 + .05)^t$$

$$A(t) = 2{,}500(1.05)^t$$

$$5{,}000 = 2{,}500(1.05)^t$$

This is the equation we need to solve.

$$2 = (1.05)^t$$

$$\log 2 = \log 1.05^t$$

$$\log 2 = t \log 1.05$$

$$\frac{\log 2}{\log 1.05} = t$$

$$14.21 = t$$

55. Suppose you deposit $2500 in a savings account that pays you 5% interest per year.

YouDO

b. How many years will it take for your account to reach $8,000.

$$8{,}000 = 2{,}500(1.05)^t$$

What equation do we need to solve?

$$3.2 = (1.05)^t$$

$$\log 3.2 = \log 1.05^t$$

$$\log 3.2 = t \log 1.05$$

$$\frac{\log 3.2}{\log 1.05} = t$$

$$23.89 = t$$

Complete page 205 in your workbook. 1-6

This will be a classwork grade. You may use your notes.

Then you can work on your homework.