Today's Plan:

Learning Target (standard): I will solve logarithmic and exponential equations.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

Find the domain and intercepts:

$$f(x)=2\log_2\left(\frac{x^2-1}{x+1}\right)-3$$

$\frac{(x+1)(x-1)}{x+1}>0$

$x-1>0$

$x>1$

D: $\{x \mid x>1\}$

I_x: $(2\sqrt{2}+1, 0)$

$0=2\log_2(x-1)-3$

$3=2\log_2(x-1)$

$\frac{3}{2}=\log_2(x-1)$

$2^{\frac{3}{2}}=x-1$ $\sqrt{2\cdot 2\cdot 2}$ $2\sqrt{2}$

$\sqrt{8}=x-1$

$2\sqrt{2}=x-1$

$x=2\sqrt{2}+1$

I_y: —

$y=2\log_2(0-1)-3$

$y=2\log_2(-1)-3$

not possible

Write as a sum/difference of logarithms.

$$\log_3\left[\frac{x^4\sqrt[3]{3-2x}}{9(4x-5)^6}\right]$$

$$= \log_3 x^4\sqrt[3]{3-2x} - \log_3 9(4x-5)^6$$

$$= \log_3 x^4 + \log_3\sqrt[3]{3-2x} - \left[\log_3 9 + \log_3(4x-5)^6\right]$$

$$= 4\log_3 x + \log_3(3-2x)^{\frac{1}{3}} - \log_3 9 - \log_3(4x-5)^6$$

$$= 4\log_3 x + \frac{1}{3}\log_3(3-2x) - 2 - 6\log_3(4x-5)$$

Logarithmic & Exponential Equations:

- solve equations by finding exact solutions using algebraic methods (unless otherwise stated)

- remember, logarithms cannot be found for numbers less than or equal to 0

  - make a quick mental check to verify the logarithm of a positive number is being found

$$\log_a 0 = x \qquad \log_a(-) = x$$

$$a^x \neq 0 \qquad a^x \neq -$$

Logarithmic & Exponential Equations:

- logarithmic equations where properties can be applied usually result in an exact value

- exponential equations where the bases are the same or can be made the same usually result in an exact value

- exponential equations where the bases are not the same and cannot be made the same usually result in solutions containing logarithmic values

* on all logarithmic equations, the bases must match *

Solve:

$$\log_2(2x+1)=3$$

$$y=\log_a x$$
$$a^y=x$$

$2^3=2x+1$

$8=2x+1$

$7=2x$

$x=\frac{7}{2}$

Solve:

$$\log_a M = \log_a N$$

$$\frac{1}{2}\log_3 x = 2\log_3 2$$

$\log_3 x^{\frac{1}{2}} = \log_3 2^2$

$(\sqrt{x})^2 = (4)^2$

$x = 16$

Solve:

$2^c = 4$

$$3\log_2(x-1) + \log_2 4 = 5$$

$3\log_2(x-1) + 2 = 5$

$3\log_2(x-1) = 3$

$\log_2(x-1) = 1$

$2^1 = x-1$

$2 = x-1$

$x = 3$

Solve:

$$\log_a(x-1)-\log_a(x+6)=\log_a(x-2)-\log_a(x+3)$$

$$\log_a\left(\frac{x-1}{x+6}\right)=\log_a\left(\frac{x-2}{x+3}\right)$$

$$\frac{x-1}{x+6}=\frac{x-2}{x+3}$$

$$(x-1)(x+3)=(x-2)(x+6)$$

$$x^2+2x-3=x^2+4x-12$$

$$2x-3=4x-12$$

$$9=2x$$

$$x=\frac{9}{2}$$

Solve:

$$2^{2x+1}=4$$

1) bases equal
2) bases can be made equal
3) bases never equal

$$2^{2x+1}=2^2$$

$$2x+1=2$$

$$2x=1$$

$$x=\frac{1}{2}$$

Solve:

$$2^x \cdot 8^{-x} = 4^x$$

$2^x \cdot (2^3)^{-x} = (2^2)^x$

$2^x \cdot 2^{-3x} = 2^{2x}$

$2^{x-3x} = 2^{2x}$

$2^{-2x} = 2^{2x}$

$-2x = 2x$

$-4x = 0$

$x = 0$

Solve:

$$3^{1-2x} = 4^x$$

* If the bases cannot be made the same, take the logarithm of both sides *

$\ln 3^{1-2x} = \ln 4^x$

$(1-2x)\ln 3 = x \ln 4$

$\ln 3 - 2x \ln 3 = x \ln 4$

$\ln 3 = x \ln 4 + 2x \ln 3$

$\ln 3 = x(\ln 4 + 2\ln 3)$

$$\frac{\ln 3}{\ln 4 + 2\ln 3} = x$$

Assignment:

p.339 #4-60 (by4)

* Write the problem & show ALL steps *