15.) $4\ln(-x) + 3 = 21$

$\quad\quad\quad\quad\quad -3 \quad\quad -3$

$4\ln(-x) = 18$

$e^{\ln(-x)} = e^{\frac{18}{4}}$

$-x = e^{18/4}$

$-x = 90.017$

$\boxed{x = -90.017}$

4.) $\dfrac{1}{3^x} = \dfrac{5}{1}$

$\log 3^x = \log \dfrac{1}{5}$

$\dfrac{x \log 3}{\log 3} = \dfrac{\log \frac{1}{5}}{\log 3}$

-1.465

$3^{-x} = 5$

2.) $\log 2^{5x-3} = \log 12$

$$\frac{(5x-3)\log 2}{\log 2} = \frac{\log 12}{\log 2}$$

$$5x - 3 = 3.5849$$

$$x = 1.317$$

14.) $\log_4(-x) + \log_4(x+10) = 2$

$$\log_4(-x(x+10)) = 4^2$$

$$-x^2 - 10x = 16$$

$$-x^2 - 10x - 16 = 0$$

$$x^2 + 10x + 16 = 0$$

$$(x+8)(x+2) = 0$$

$$x = -2, -8$$

10.) $5\ln x = 35$

$\ln x = 7$

$e^{\ln x} = e^7$

$x = 1096.633$

19.) $\frac{1}{3} \log_5 12x = 2$

$\frac{5}{5} \log_5 12x = \frac{6}{5}$

$12x = 15625$

$x = 1302.083$

8.) $\dfrac{e^{x+2}}{3} + \dfrac{5}{-5} = \dfrac{6}{-5}$

1

$\ln e^{x+2} = \ln 3$

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

$x = -2 + \ln 3$

1.) $\ln 5^{x+3} = \ln 7$

$$\frac{(x+3)\ln 5}{\ln 5} = \frac{\ln 7}{\ln 5}$$

$$x + 3 = \frac{\ln 7}{\ln 5}$$

$$x = -1.791$$

20.) $2\log x + \log 7 = \log 14x$

$\log x^2 + \log 7 = \log 14x$

$\cancel{10}\log(x^2 \cdot 7) = \log 14x \cancel{10}$

$7x^2 = 14x \qquad x(x-2) = 0$

$x^2 = 2x \qquad \cancel{x = 0}$

$x^2 - 2x = 0 \qquad \boxed{x = 2}$

A2: Finding Inverses of Exponential and Logarithmic Functions, Solving Exponential and Logarithmic Equations - Mixed Practice

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"If I work hard, I'll get good grades. If I get good grades, I'll go to a top college. If I go to a top college, I'll get a great job. If I get a great job, I'll make a lot of money. If I make a lot of money, everyone will hate me. That's why I didn't do my homework."

HW:

ex: Find the inverse.

a) $f(x) = 2^{x+1} - 3$

$$x = 2^{y+1} - 3$$

$$\log_2(x+3) = \log_2 2^{y+1}$$

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

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

$$f^{-1}(x) = \log_2(x+3) - 1$$

ex: Find the inverse.

b) $f(x) = \log_5(x - 5) + 2$

$$x = \log_5(y - 5) + 2$$

$$x - 2 = \log_5(y - 5)$$

$$5^{x-2} = y - 5$$

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

ex: Find the inverse.

c) $h(x) = \ln x - 1$

$$x = \ln y - 1$$

$$e^{x+1} = e^{\ln y}$$

$$e^{x+1} = h^{-1}(x)$$

f NO calc.
K

ex: Find the inverse.

d) $g(x) = 5^{x-6}$

$\log_5(x) = \log_5 5^{y-6}$

$\log_5(x) = y - 6$

$\log_5(x) + 6 = y$

$g^{-1}(x) = \log_5(x) + 6$

ex: Solve. Round to 3 decimal places when necessary and check for extraneous solutions.

a) $5^{x+3} + 1 = 17$

$$\log\left(5^{x+3}\right) = \log(16)$$

$$(x+3)\log 5 = \log 16$$

$$x + 3 = 1.7227$$

$$x = -1.277$$

ex: Solve. Round to 3 decimal places when necessary and check for extraneous solutions.

b) $\log_7(x - 2) + \log_7(x + 3) = \log_7 14$

$$\log_7(x^2 + x - 6) = \cancel{\log_7} 14$$

$$x^2 + x - 6 - 14 = 0$$

$$x^2 + x - 20 = 0$$

$$(x + 5)(x - 4) = 0$$

$$4, \cancel{-5}$$

ex: Solve. Round to 3 decimal places when necessary and
check for extraneous solutions.

c) $\log_3(7x + 3) = \log_3(5x + 9)$

$$7x + 3 = 5x + 9$$
$$2x = 6$$
$$x = 3$$

ex: Solve. Round to 3 decimal places when necessary and
check for extraneous solutions.

d) $\log \left(\dfrac{1}{3}\right)^{x-1} = \log 6$

$$\dfrac{(x-1) \log \frac{1}{3}}{\log \frac{1}{3}} = \dfrac{\log 6}{\log \frac{1}{3}}$$

$$x - 1 = -1.6309$$

$$x = -.631$$

ex: Solve. Round to 3 decimal places when necessary and check for extraneous solutions.

e) $\log(5x - 11) = 2$

$10 \qquad\qquad 10$

$5x - 11 = 100$

$x = 22.2$

ex: Solve. Round to 3 decimal places when necessary and check for extraneous solutions.

f) $\left(\dfrac{1}{3}\right)^{x-1} = 27^{x+9}$

$$3^{-1(x-1)} = 3^{3(x+9)}$$

$$-x+1 = 3x+27$$

$$-26 = 4x$$

$$\dfrac{-26}{4} = x$$

ex: Solve. Round to 3 decimal places when necessary and check for extraneous solutions.

g) $5^{2x+1} = 8$

$$\log 5^{2x+1} = \log 8$$

$$(2x+1) = \frac{\log 8}{\log 5}$$

$$X = .146$$

ex: Solve. Round to 3 decimal places when necessary and
check for extraneous solutions.

h) $\log_4(2x + 1) = \log_4(x + 2) - \log_4 3$

$$\log_4(2x+1) = \log_4\left(\frac{x+2}{3}\right)$$

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

$$6x+3 = x+2$$

$$x = -\frac{1}{5}$$

ex: Solve. Round to 3 decimal places when necessary and
check for extraneous solutions.

i) $3 - \ln(4x - 3) = 0$

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

$$e^{\ln(4x-3)} = e^{3}$$

$$4x-3 = e^{3}$$

$$x = 5.771$$

ex: Solve. Round to 3 decimal places when necessary and check for extraneous solutions.

j) $2\log_2(5x + 7) - 1 = 9$

$$2^{\log_2(5x+7)} = 2^{\frac{5}{2}}$$

$$5x + 7 = 32$$

$$x = 5$$

ex: Solve. Round to 3 decimal places when necessary and check for extraneous solutions.

k) $2 \cdot 3^{2x} + 7 = 25$

$$3^{2x} = 9$$

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

$$2x = 2$$

$$x = 1$$

ex: Solve. Round to 3 decimal places when necessary and check for extraneous solutions.

1) $\log_5 x + \log_5 (x - 12) = 3$

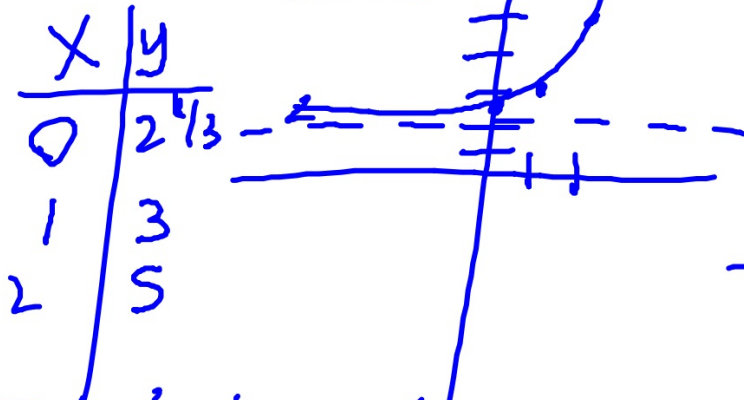$\boxed{18.689}$

$$\log_5 \frac{(x^2 - 12x)}{S} = \frac{3}{S}$$

$$x^2 - 12x - 125 = 0$$

$$x = \frac{12 \pm \sqrt{144 - 4(1)(-125)}}{2(1)}$$
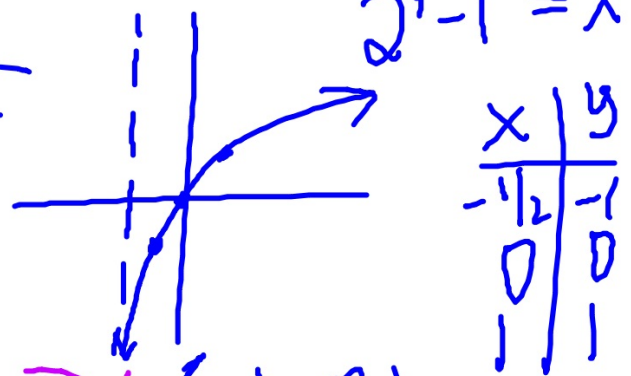
$$x = \frac{12 \pm \sqrt{644}}{2}$$

$$x = \frac{12 + \sqrt{644}}{2}$$

① $y = 3^{x-1} + 2$

HA

x	y
0	$2\frac{1}{3}$
1	3
2	5

D: $\{x \mid x \in R\}$

R: $\{y \mid y > 2\}$

(set)

② $y = \log_2(x+1)$

VA $2^y = x+1$

$2^y - 1 = x$

x	y
$-\frac{1}{2}$	-1
0	0
1	1

D: $(-1, \infty)$

R: $(-\infty, \infty)$

(interval)