SM 3H

Date: 1/10/24 **Section:** 5.5

Objective: ① I can find the inverse. ② I can solve using "U" substitution.

Steps for finding the inverse:

1. Flip-flop the x and y
2. Solve for y

EXAMPLES: Find the inverse.

1. $f(x) = \log_8(2x+1) - 6$

$x = \log_8(2y+1) - 6$

$8^{x+6} = \cancel{\log_8}(2y+1)$

$8^{x+6} = 2y+1$

$8^{x+6} - 1 = 2y$

$\frac{8^{x+6}-1}{2} = f^{-1}(x)$

2. $f(x) = 2 \cdot 3^{x+1} - 4$

3. $f(x) = \frac{e^{\frac{5x-1}{2}}+8}{3}$

$x = \frac{e^{\frac{5y-1}{2}}+8}{3}$

$3x = e^{\frac{5y-1}{2}} + 8$

$\ln 3x - 8 = \cancel{\ln} e^{\frac{5y-1}{2}}$

$\ln(3x-8) = \frac{5y-1}{2}$

$2\ln(3x-8) = 5y-1$

$2\ln(3x-8)+1 = 5y$

$\frac{2\ln(3x-8)+1}{5} = f^{-1}(x)$

$\frac{2}{5}\ln(3x-8) + \frac{1}{5}$

Steps for "U" substitution:

1. Set u equal to the middle term's variable
2. Square step #1 to find u^2
3. Replace u and u^2 in the original equation for the variables
4. Factor
5. Solve for u
6. Substitute x back in and solve for x
7. Check for extraneous solutions

EXAMPLES: Solve for the variable.

1. $e^{6x} + 4e^{3x} - 32 = 0$ $u = e^{3x}$

$u^2 + 4u - 32 = 0$

$(u+8)(u-4) = 0$

$u = -8 \quad u = 4$

$\cancel{e^{3x} = -8}$ $\cancel{\ln} e^{3x} = \ln 4$

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

$x \approx .4621$

2. $2 \cdot 6^{4x} - 6^{2x} - 6 = 0$ $u = 6^{2x}$

$2u^2 - u - 6 = 0$

$(2u+3)(u-2) = 0$

$u = \frac{-3}{2} \quad u = 2$

$\cancel{6^{2x} = -\frac{3}{2}}$ $\cancel{\log_6} 6^{2x} = \log_6 2$

$\frac{2x = \log_6 2}{2}$

$x = \frac{\log 2}{\log 6} \div 2$

$x \approx .1934$