

Write Class Notes on U Substitution Below:

Solve $3^{2x} - 5(3^x) + 4 = 0$
 Looks like quadratic.
 $u = 3^x \quad u^2 = (3^x)^2 = 3^{2x}$
 $u^2 - 5u + 4 = 0$
 $(u-1)(u-4) = 0$
 $u = 1 \quad u = 4$

These are NOT your answers!
 Sub back in to $u = 3^x$.
 $1 = 3^x \quad 4 = 3^x$
 $\log_3 1 = x \quad \log_3 4 = x$
 $0 = x \quad 1.262 = x$

Solve $2^x + 8(2)^{-x} = 9$
 $\left(2^x + \frac{8}{2^x} = 9\right) 2^x$
 $(2^x)^2 + 8 = 9(2^x)$
 Rearrange.
 $2^{2x} - 9(2^x) + 8 = 0$
 $u = 2^x \quad u^2 = 2^{2x}$
 Rewrite.
 $u^2 - 9u + 8 = 0$
 $(u-8)(u-1) = 0$
 $u = 8 \quad u = 1$
 Sub back in!
 $8 = 2^x \quad 1 = 2^x$
 $2^3 = 2^x \quad 1 = 2^0$
 $3 = x \quad x = 0$

Name _____

Solve $x^{2/3} + 3(x^{1/3}) + 2 = 0$
 $u = x^{1/3} \quad u^2 = x^{2/3}$
 $u^2 + 3u + 2 = 0$
 $(u+1)(u+2) = 0$
 $u = -1 \quad u = -2$
 Sub back in!
 $-1 = x^{1/3} \quad -2 = x^{1/3}$
 Cube each side
 $(-1)^3 = x \quad (-2)^3 = x$
 $-1 = x \quad -8 = x$

Practice U Substitution Below:

<p>1. $3^{(2x)} + 3^x - 2 = 0$ $u = 3^x \quad u^2 = 3^{2x}$ $u^2 + u - 2 = 0$ $(u+2)(u-1) = 0$ $u = -2 \quad u = 1$ $-2 = 3^x \quad 1 = 3^x$ $\log_3(-2) = x \quad \log_3 1 = x$ NO solution $0 = x$</p>	<p>2. $3^{(4x)} + 5(3^{2x}) - 24 = 0$</p>	<p>3. $e^{(4x)} - 3e^{(2x)} - 18 = 0$ $u = e^{2x} \quad u^2 = e^{4x}$ $u^2 - 3u - 18 = 0$ $(u-6)(u+3) = 0$ $u = 6 \quad u = -3$ $6 = e^{2x} \quad -3 = e^{2x}$ $\ln 6 = 2x \quad \ln e^{-3} = 2x$</p>
<p>4. $2x^{1/2} + x^{1/4} - 15 = 0$</p>	<p>5. $9^x + (3)3^x = 4$ $(3^2)^x + 3(3^x) = 4$ $u = 3^x \quad u^2 = 3^{2x}$ $u^2 + 3u - 4 = 0$ $(u+4)(u-1) = 0$ $u = -4 \quad u = 1$ $-4 = 3^x \quad 1 = 3^x$ $\log_3(-4) = x \quad \log_3(1) = x$ NO solution $0 = x$</p>	<p>6. $2x + 3x^{1/2} + 1 = 0$</p>
<p>7. $2x^{2/3} - 9x^{1/3} - 5 = 0$</p>	<p>8. $8x^{2/3} - 7x^{1/3} - 1 = 0$</p>	<p>9. $3x^{-2} + 5x^{-1} - 2 = 0$ $u = x^{-1} \quad u^2 = x^{-2}$ $3u^2 + 5u - 2 = 0$ $(3u^2 + 6u)(u-2) = 0$ $3u(u+2) - 1(u+2) = 0$ $(3u-1)(u+2) = 0$ $u = 1/3 \quad u = -2$ $1/3 = x^{-1} \quad (-2) = (x^{-1})$ $(1/3)^{-1} = x \quad (-2)^{-1} = x$</p>

Extra Help on U Substitution: <http://www.openalgebra.com/search/label/u-substitution>