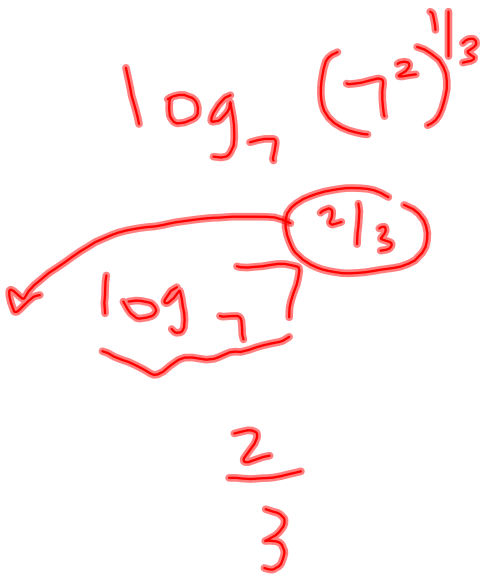
5.4 Solving Exponential and Logarithmic Functions

$$\log_4 \frac{36}{9} = \log_4 4 = 1$$

$$\log_4 (4 \cdot 9) - \log_4 9$$

$$\log_4 4 + \log_4 9 - \log_4 9$$

$$1$$


$\log_7 (7^2)^{1/3}$
$2/3$
$\log_7 7$
$\frac{2}{3}$

$$\log 6x^5 - \log y$$

$$\log 6 + 5\log x - \log y$$

$$\frac{1}{5}\left[\log_b 7x\right] - \left(\log_b y\right)$$

$$\log_b \sqrt[5]{\frac{7x}{y}}$$

Things to remember:

a) $a^x = a^y$, if and only if $x=y$

b) $\log_a x = \log_a y$ if and only if $x=y$

c) $a^{\log_a x} = x$

$\sqrt[2]{x^2}$ $\qquad$ $(\sqrt{x})^2$

d) $\log_a a^x = x$

Solve: $e^x=72$

$\ln e^x = \ln 72$

$x = 4.28$

$x \approx 2 - 3$

ln(72
4.276666119

6 4
72

Solve: $4e^{2x} - 3 = 2$

$4e^{2x} = 5$

$e^{2x} = \frac{5}{4}$

$\ln e^{2x} = \ln \frac{5}{4}$

$2x = .22$

$x = .11$

```
ln(5/4
        .2231435513
Ans/2
        .1115717757
```

Solve: $2(3^{2t-5}) - 4 = 11$

$2(3^{2t-5}) = 15$

$3^{2t-5} = \frac{15}{2}$

$\log_3 3^{2t-5} = \log_3 \frac{15}{2}$

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log(15/2)/log(3
      1.834043767
```

$2t-5 = \frac{\log \frac{15}{2}}{\log 3}$

$2t-5 = 1.83$

```
log(15/2)/log(3
      1.834043767
Ans+5
      6.834043767
Ans/2
      3.417021884
```

$t = 3.42$

Solve: $e^{2x} - 3e^{x} + 2 = 0$

$a^2 - 3a + 2 = 0$

$(a-2)(a-1) = 0$

$a = 2 \quad a = 1$

$e^x = 2 \quad e^x = 1$

$\ln e^x = \ln 2 \quad x = 0$

$x = .69$

$a = e^x$

$(e^x)^2$

Solve: $\ln x = 2$

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

$x = e^2$

e^2 7.389056099

Solve: $\log_3(5x - 1) = \log_3(x + 7)$

$5x - 1 = x + 7$

$x = 2$

Solve: $5 + 2\ln x = 4$

$2\ln x = -1$

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

$e^{\ln x} = e^{-1/2}$

$x = 0.61$

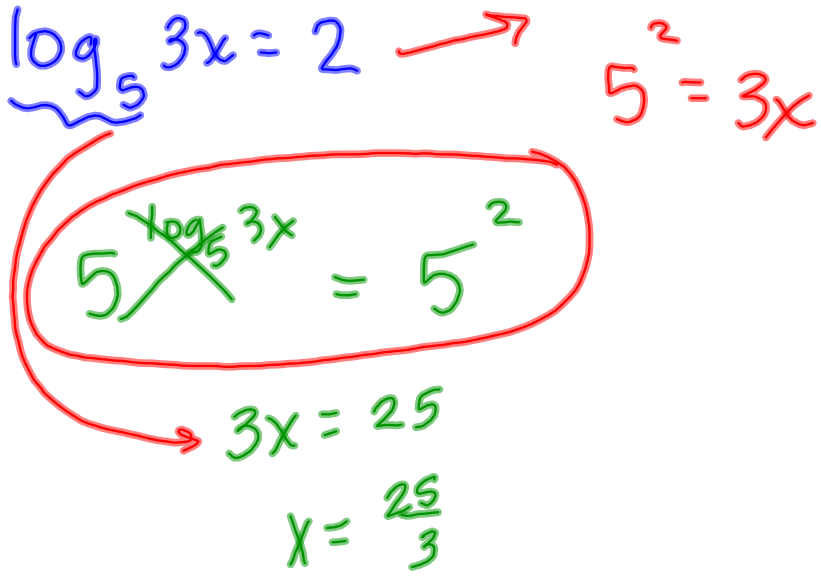
$e^{\ln x^2} = e^{-1}$

$x^2 = e^{-1}$

$x = \pm$

extraneous!

Solve: $2\log_5 3x = 4$



Solve: $\ln(x-2) + \ln(2x-3) = 2\ln x$

$$\ln(2x^2-7x+6) = \ln x^2$$

$$2x^2-7x+6 = x^2$$

$$x^2-7x+6=0$$

$$(x-6)(x-1)=0$$

$$x=6 \text{ or } \cancel{x}$$

You have deposited $500 in an account that pays %6.75 interest, compounded continously. How long will it take your money to double?

$$A = Pe^{rt}$$

$$1000 = 500e^{.0675t}$$

log(4.5)/log(6
.8394415783

Solve:

$$6^{x+1} = 4.5^{3x-1}$$

$$\log_6 6^{x+1} = \log_6 4.5^{3x-1}$$

$$x+1 = (3x-1)\log_6 4.5$$

$$\log_6 4.5 = \frac{\log 4.5}{\log 6}$$

$$x+1 = .84(3x-1)$$

```
log(4.5)/log(6
     .8394415783
```

Solve:

$$6^{x+1} = 4.5^{3x-1}$$

$$\log 6^{x+1} = \log 4.5^{3x-1}$$

$$.78(x+1) = .65(3x-1)$$

$$\ln e^{2x+1} = 9$$

$$2x+1 = 9$$

$$x = 4$$