Math 190 Logarithm Note

Review the following Lab questions to make sure you are solving efficiently.

Questions:

1. Let's solve for x in the following:

$$e^{2\ln x} = 7.$$

Now we could take the natural logarithm of both sides, solve for $\ln x$ and then take e to the power of both sides. That is

$$\ln(e^{2\ln x}) = \ln 7$$
$$2\ln x = \ln 7$$
$$\ln x = \frac{\ln 7}{2}$$
$$e^{\ln x} = e^{\frac{\ln 7}{2}}$$
$$x = e^{\frac{\ln 7}{2}}$$
$$x = (e^{\ln 7})^{1/2}$$
$$x = \sqrt{7}$$

Alternatively we can use exponent rules to write

$$e^{2\ln x} = 7$$
$$(e^{\ln x})^2 = 7$$
$$x^2 = 7$$
$$x = \sqrt{7}.$$

2. Now let's solve

$$\ln(3e^{2x}) = 4.$$

Again we could take e to the power of both sides, divide both sides by 3 and then take ln of both sides. That is

$$e^{\ln(3e^{2x})} = e^4$$
$$3e^{2x} = e^4$$
$$e^{2x} = \frac{e^4}{3}$$
$$2x = \ln\left(\frac{e^4}{3}\right)$$
$$2x = \ln(e^4) - \ln(3)$$
$$x = \frac{4 - \ln(3)}{2}.$$

Alternatively we can use log rules to see

$$\ln(3e^{2x}) = 4$$
$$\ln(3) + \ln(e^{2x}) = 4$$
$$2x = 4 - \ln(3)$$
$$x = \frac{4 - \ln(3)}{2}.$$