## Quiz 19

## **Матн-1150-еs32**

Solve the following equations. (Show at least one intermediate step for each.) Either leave the answer in exact form or round off to three decimal places.

1  $\log_2(x+7) + \log_2(x+8) = 1$ 

I combine both sides into a single logarithm, then drop the logarithms:

$$\log_2 (x+7) + \log_2 (x+8) = 1;$$
  

$$\log_2 [(x+7)(x+8)] = \log_2 2;$$
  

$$(x+7)(x+8) = 2;$$
  

$$x^2 + 15x + 54 = 0;$$
  

$$x = -9 \text{ or } x = -6.$$

However, I must check for extraneous solutions; if x = -9, then x + 7 or x + 8 is negative, and I can't take a logarithm of a negative number. If x = -6, however, then x + 7 and x + 8 are both positive, so this solution should work. Therefore,

x = -6.

## **2** $2^x = 10$

To solve this, I take logarithms base 2 and break down the result:

$$2^{x} = 10;$$
  

$$\log_{2} (2^{x}) = \log_{2} 10;$$
  

$$x \log_{2} 2 = \log_{2} (2 \cdot 5);$$
  

$$x(1) = \log_{2} 2 + \log_{2} 5;$$
  

$$x = 1 + \log_{2} 5.$$

To get a numerical approximation, I switch to a base that my calculator can handle:

$$x = 1 + \log_2 5 = 1 + \frac{\log 5}{\log 2} \approx 3.322.$$