Name: _____

1. Solve for all $x$ that satisfy,
$$\log(x+3) - \log(x+1) = \log(2)$$

2. Solve for all $x$ that satisfy,
$$\log_2(x+1) + \log_2(x+4) = 1$$

3. Solve for all $x$ that satisfy,
$$e^x + e^{-x} = 3$$

4. Dr. Neff is studying the growth of a bacteria population. The Petri dish originally contains 10 cells. After 3 hours, Dr. Neff notes that the population has increased to 25 cells. Assuming the population growth is exponential, what is the doubling time of the population? You may express your answer in terms of logarithms.

5. Two fly populations can be modeled by continuous exponential growth. The first population starts off with 50 flies and has a growth rate of 15% per day. The second population starts off with 10 flies and has a growth rate of 25% per day. After how many days will the second population be equal to the first? You may express your answer in terms of logarithms.

6. Jean puts $10000 into a bank account that compounds continuously at an annual interest rate of 2%. How long will it take for her to earn $5000 of interest on her original deposit? You may express the answer in terms of logarithms.

7. Find the endpoint of the radius of the unit circle corresponding to the given angle.

   (a) $\theta = 300°$

   (b) $\theta = -\dfrac{10\pi}{6}$
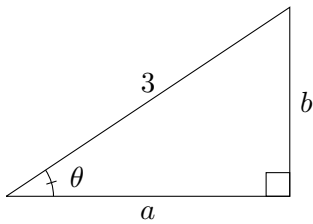
   (c) $\theta = \dfrac{23\pi}{3}$

8. Compute the following,

   (a) $\cos\left(\dfrac{14\pi}{3}\right)$

   (b) $\tan\left(\dfrac{-28\pi}{6}\right)$

   (c) $\csc\left(\dfrac{5\pi}{2}\right)$

9. Determine the values of $a$ and $b$ given that $\tan\theta = \frac{3}{4}$.

10. Find the smallest number $x$ such that $\cos(e^x) = 0$.

11. Simplify the expression,

$$\left( \frac{1}{1 + \cos\theta} + \frac{1}{1 - \cos\theta} \right) \tan\theta$$

12. Prove the following equality is satisfied for any $\theta \in (-\pi/2, \pi/2)$,

$$\sin^2\theta = \frac{\tan^2\theta}{1 + \tan^2\theta}$$