MATH 1 Homework 3

Assigned September 28th, due October 5th

1. In the following problems, solve for all possible values of x:

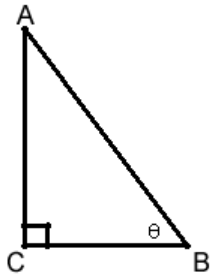
   (a) $\log_4(x) + \log_{16}(x) = 3$

   (b) $2^{2^x} = 4^{4^x}$

   (c) $2^{2^x} = 4^{2^x}$

   (d) $\log_2(x) = 2\log_4(x)$

2. (a) In the figure below we have a right triangle where the length of the side BC is 7, the length of AB is 10, and the angle between AB and BC is θ. Find $\sin(\theta), \cos(\theta), \tan(\theta)$.



   Based on your calculations above, choose the right answer from below and justify your choice:

   - $\theta > \frac{\pi}{3}$
   - $\theta < \frac{\pi}{6}$
   - $\frac{\pi}{6} < \theta < \frac{\pi}{3}$

   (b) Draw the unit circle and find the following points on the unit circle: $(\cos(\frac{\pi}{10}), \sin(\frac{\pi}{10}))$, $(\cos(\frac{11\pi}{10}), \sin(\frac{11\pi}{10}))$, $(\cos(\frac{14\pi}{10}), \sin(\frac{14\pi}{10}))$.
   From the picture you've drawn, is $\cos(\frac{14\pi}{10}) > -\frac{1}{2}$ or $\cos(\frac{14\pi}{10}) < -\frac{1}{2}$? Is $\sin(\frac{14\pi}{10}) > -\frac{1}{2}$ or $\sin(\frac{14\pi}{10}) < -\frac{1}{2}$? Justify your answer.

3. For each of the following functions, find a period and justify your answers:

   (a) $f(x) = \sin\left(\frac{1}{2}x\right)$

   (b) $g(x) = \cos(3x) + \tan(2x)$

   (c) $h(x) = \sin\left(\frac{1}{4}x\right)\cos\left(\frac{1}{5}x\right)$

4. Find the value of each expression below. For parts (c) and (d), also draw the appropriate triangle.

   (a) $\arcsin(-\frac{\sqrt{3}}{2})$

(b) $\arccos(\cos(\frac{3\pi}{2}))$

(c) $\cos(\arcsin(\frac{1}{2}))$

(d) $\tan(\arccos(\frac{2}{3}))$

5. Let $f(x) = e^{\sin(x)}$. Find the inverse f^{-1}, and specify its domain and range.