1. Differentiate the following functions by any legal method. Simplify your answers.
   
   a) \( f(x) = x \sin x + 3 \cot x \) 
   b) \( g(\theta) = \sec \theta \tan \theta \) 
   c) \( h(t) = \frac{\cos t}{1 - \sin t} \)

2. Find (and simplify) an equation for the tangent line to the curve \( y = (2 + x) \cos x \) at the point \((0, 2)\).

3. Find all values of \( x \) between 0 and \( 4\pi \) at which the graph of the function \( g(x) = x + 2 \sin x \) has a horizontal tangent line.

4. Differentiate the following functions by any legal method, and simplify your answers. You may (and should) use the differentiation rules, including the Chain Rule.
   
   a) \( f(x) = \sqrt{\cos x} \) 
   b) \( g(x) = \cos \sqrt{x} \) 
   c) \( h(t) = (3t^2 - 7t + 4)^7 \)

5. Differentiate the following functions by any legal method, and simplify your answers.
   
   a) \( F(x) = \sin(5 + x^3) \) 
   b) \( G(x) = 5 + \sin^3 x \) 
   c) \( Q(x) = (x^2 + 1)^5 (x^2 + 2)^4 \)

6. Differentiate the following functions by any legal method, and simplify your answers.
   
   a) \( y = \sin(x^2 \cos x) \) 
   b) \( R(u) = \left( \frac{u + 1}{u^3 + 4} \right)^5 \)

   c) \( f(x) = \sqrt{x + \sqrt{x}} \) 
   d) \( g(x) = \sqrt{\cos(x^2)} \)

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due Friday 10/13 by 10pm, on Gradescope.