Review.

1. Simplify as much as possible: $\sin^2(x) + \cos^2(x)$.

2. Write in terms of only $\sin(x)$ and $\cos(x)$:

   $\tan(x)$ $\cot(x)$

   $\sec(x)$ $\csc(x)$

3. Expand using angle sum formulas:

   $\sin(x+h)$ $\cos(x+h)$

4. $\lim_{h\to 0} \frac{\sin h}{h}$

5. (review-ish) $\lim_{h\to 0} \frac{\cos(h) - 1}{h}$

Problems.

1. Use the definition of the derivative to prove that $\frac{d}{dx}(\sin(x)) = \cos(x)$.

2. Use the differentiation formulas for $\sin(x)$ and/or $\cos(x)$ to verify the differentiation rule for $\tan(x)$.

3. Determine $\frac{d}{dx}\left(\frac{1}{\sqrt{x}} + \sin(x)\right)$.

4. Determine $f''(x)$ for $f(x) = 14\sec x$.

5. Differentiate the following functions.

   (a) $f(x) = \dfrac{19}{\sin(x)}$

   (b) $y = \sqrt{x}\tan(x) + \cos(x)$

   (c) $y = x^2\cos(x) - 3x\sin(x)$

   (d) $f(x) = \dfrac{\sin(x)}{2 + \tan(x)}$

   (e) $f(x) = \dfrac{e^x\sin(x) - 1}{x + 3}$

   (f) $y = (x + e^x)\left(\dfrac{\sin(x)}{\cot(x) + 12}\right)$

6. Determine an equation of the tangent line to the graph of $y = \cot(x)$ when $x = \pi/4$.

7. Use the differentiation formulas for $\sin(x)$ and/or $\cos(x)$ to verify the differentiation rule for $\csc(x)$.

8. Use the definition of the derivative to prove that $\dfrac{d}{dx}(\cos(x)) = -\sin(x)$.