

## Quiz 8

September 28, 2016

Show all work and circle your final answer.

1. Evaluate  $\arccos\left(\frac{-\sqrt{3}}{2}\right)$ . Show work or explain your answer.

$$\begin{array}{c} \diagup \quad \diagdown \\ 1 \quad 2 \quad \pi/6 \\ \hline -\sqrt{3} \end{array} \quad \arccos\left(\frac{-\sqrt{3}}{2}\right) = \boxed{\frac{5\pi}{6}}$$

2. Fill in the following chart. (No work required!)

| $f(x)$   | $f'(x)$         | $g(x)$   | $g'(x)$          |
|----------|-----------------|----------|------------------|
| $\sin x$ | $\cos x$        | $\cos x$ | $-\sin x$        |
| $\sec x$ | $\sec x \tan x$ | $\csc x$ | $-\csc x \cot x$ |
| $\tan x$ | $\sec^2 x$      | $\cot x$ | $-\csc^2 x$      |

3. Suppose that  $f(x)$  is a differentiable function with  $f(0) = 1$  and  $f'(0) = 3$ . Let  $g(x) = \frac{\sec x}{f(x) \cos x}$ . Find  $g'(0)$ .

$$g'(x) = \frac{f(x) \cos x (\sec x \tan x) - \sec x (f'(x) \cos x + f(x)(-\sin x))}{(f(x) \cos x)^2}$$

$$g'(0) = \frac{1 \cdot 1 \cdot 1 \cdot 0 - 1(3 \cdot 1 + 1 \cdot 0)}{(1 \cdot 1)^2} = \frac{0 - 3}{1} = \boxed{-3}$$

4. Evaluate  $\lim_{x \rightarrow 0} \frac{\sin^2(3x)}{\tan^2(4x)}$ .

$$\begin{aligned} &= \lim_{x \rightarrow 0} \frac{\sin 3x}{1} \cdot \frac{\sin 3x}{1} \cdot \frac{\cos 4x}{\sin 4x} \cdot \frac{\cos 4x}{\sin 4x} \\ &= \lim_{x \rightarrow 0} \frac{\sin 3x}{1} \cdot \frac{\sin 3x}{1} \cdot \frac{1}{\sin 4x} \cdot \frac{1}{\sin 4x} \quad (\text{since } \cos 0 = 1) \\ &= \lim_{x \rightarrow 0} \frac{3x}{3x} \cdot \frac{\sin 3x}{1} \cdot \frac{3x}{3x} \cdot \frac{\sin 3x}{1} \cdot \frac{4x}{4x} \cdot \frac{1}{\sin 4x} \cdot \frac{4x}{4x} \cdot \frac{1}{\sin 4x} \\ &= \lim_{x \rightarrow 0} \frac{3x \cdot 3x}{4x \cdot 4x} \quad (\text{since } \lim_{x \rightarrow 0} \frac{\sin x}{x} = 1) \\ &= \boxed{\frac{9}{16}} \end{aligned}$$