Recitation #10 - 3.5 Derivatives of Trig Functions (Solutions)

Warm up:

Solution:

Group work:

Problem 1 *Find the following limits:*

(a) $\lim\limits_{x \to 0} \dfrac{\sin(8x)}{x}$

   Solution:

(b) $\lim\limits_{x \to 0} \dfrac{\cos^2(x) - 1}{4x}$

   Solution:

(c) $\lim\limits_{x \to 0} \dfrac{x}{\tan(5x)}$

   Solution:

Problem 2 *Find the derivative of the following functions:*

(a) $f(x) = \dfrac{x + 5}{7x^6 + \cot(x)}$

   Solution: $f'(x) = \dfrac{(7x^6 + \cot(x))(1) - (x + 5)(42x^5 - \csc^2(x))}{(7x^6 + \cot(x))^2} = f'(x) = \dfrac{7x^6 + \cot(x) - (x + 5)(42x^5 - \csc^2(x))}{(7x^6 + \cot(x))^2}.$

(b) $f(x) = \sin(x)\cos(x)$

   Solution: $f'(x) = (\cos(x))(\cos(x)) + (\sin(x))(-\sin(x)) = \cos^2(x) - \sin^2(x).$

(c) $f(x) = \dfrac{e^x \tan(x)}{\sec(x) + 2}$

$\quad$ **Solution:** $\quad f'(x) = \dfrac{(\sec(x) + 2)(e^x \tan(x) + e^x \sec^2(x)) - e^x \tan(x)(\sec(x)\tan(x))}{(\sec(x)+2)^2} =$

$\quad \dfrac{e^x[(\sec(x)+2)(\tan(x) + \sec^2(x)) - \sec(x)\tan^2(x)]}{(\sec(x)+2)^2}.$

(d) $f(x) = \sin(x)\cos(x)e^{3x}$

$\quad$ **Solution:** $\quad f'(x) = \dfrac{d}{dx}(\sin(x)\cos(x))e^{3x} + (\sin(x)\cos(x))\dfrac{d}{dx}(e^{3x})$

$\quad = (\cos^2(x) - \sin^2(x))e^{3x} + 3e^{3x}\sin(x)\cos(x)$

$\quad = e^{3x}(\cos^2(x) + 3\sin(x)\cos(x) - \sin^2(x)).$

Problem 3 *Solution:*

Problem 4 *Solution:*