Derivatives of Trigonometric Functions

Solutions should show all of your work, not just a single final answer.

1. Compute the derivative of each function below using differentiation rules.

   (a) $f(x) = x^3 \cos x$

   (b) $f(x) = \dfrac{\sin x}{4e^x - \csc x}$

   (c) $f(x) = 17e^x \tan x$

   (d) $f(x) = \dfrac{\sec x}{\sqrt{x}}$

   For this part, compute the derivative in two ways:
   (i) using the Quotient Rule, and (ii) using the Product Rule

2. Find the equation of the tangent line to the curve $y = \sin x \cos x$ at $x = \frac{\pi}{4}$.

3. Find the derivative $\dfrac{d^{2016}}{dx^{2016}}(-2\cos x)$ by finding the first six to eight derivatives and observing the pattern that occurs.

4. Find the limit.

   (a) $\lim\limits_{x \to 0} \dfrac{\sin 4x}{x}$ (b) $\lim\limits_{x \to 0} \dfrac{\sin 7x}{5x}$