

1. Differentiate the function $f(x) = x^3 \cos x$
2. Differentiate the function $f(x) = \frac{3x \sin x}{x^2 - \sec x}$
3. Differentiate the function $f(x) = e^x(\cot x - x^2)$
4. Find an equation of the tangent line to the curve $y = \frac{\cos x}{1 - \sin x}$ at the point $(0, 1)$
5. For what value(s) of x does the graph of $f(x) = \sin^2 x$ have a horizontal tangent?
[Hint: $\sin^2 x = \sin x \cdot \sin x$]
6. Evaluate the limit: $\lim_{x \rightarrow 0} \frac{\sin(7x)}{2x}$
7. Evaluate the limit: $\lim_{x \rightarrow 0} \frac{\sin(5x)}{\tan(4x)}$
8. Evaluate the limit: $\lim_{x \rightarrow 0} \frac{\cos x - 1}{5x^2}$
9. Evaluate the limit: $\lim_{x \rightarrow 0} \frac{\sin(3x^4)}{5x^3}$
10. Evaluate the limit: $\lim_{x \rightarrow \pi/2} (\sec x \cos(\cos x) - \sec x)$