

1. Find  $f'(x)$  if  $f(x) = 3\sin^{-1}(4x-2) + 6\cos^{-1}(5x-8)$

2. Let  $f(x) = \begin{cases} ax^2 + 8x & x \leq 1 \\ bx^3 & x > 1 \end{cases}$

Find values of  $a$  and  $b$  such that  $f(x)$  is differentiable at  $x = 1$ . Use proper limit notation.

3. If  $\begin{cases} x = t^6 \\ y = 5t^3 - 2t^{-1} \end{cases}$  find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$

4. Find the derivative of  $f(x) = \sec^{-1}(e^{2x})$

5. If  $\begin{cases} x = t - 2 \\ y = 3t^2 + 1 \end{cases}$  find the equation of the tangent line when  $t = 3$ .

6. Find  $\frac{dy}{dx}$  for  $\begin{cases} x = \sec t \\ y = t \ln t \end{cases}$