

1. (14 points) Answer the questions below:

(a) (5 points) Find $\frac{d}{d\theta} [(\cos \theta)e^{\sec \theta}]$.

(b) (4 points) For $g(t) = \arctan(t \ln t)$, find $g'(t)$.

(c) (5 points) Given that $y = e^{\arcsin(t^2)}$, find $\frac{dy}{dt}$.

2. **(6 points)** $2x^2 - 3xy - 6y^2 + 2x - 4y = -6$ is the equation of a hyperbola.

(a) **(4 points)** On this curve, find $\frac{dy}{dx}$ as an expression in x and y .

(b) **(2 points)** Find the equation of the tangent line to this curve at $(1, -2)$.

3. **(2 point bonus)** Given an invertible function $f(x)$ and its inverse $g(y)$, if $f(x_0) = y_0$, find an expression for $g'(y_0)$ in terms of $f'(x_0)$.