Applying Calculus: Working with Rates of Change & Tangents & Normals

1. (CI) Determine the equation of the line tangent to $y = x^3 \ln(x)$ at the point where $x = 1$.

2. (CI) Determine the equation of the line normal to $y = \cos(\pi - 2x)$ at the point where $x = \frac{\pi}{4}$.

3. (CI) Find the point(s) where the tangent line to the curve of $f(x) = e^{2x - 3x^2}$ is horizontal.

4. (CI) Find the minimal value of $g(x) = \frac{1}{x} \times e^x$.

5. (CI) Determine the equation of the tangent to $y = (2x^3 - 4x + 2)(x^2 - 3x + 1)$ at the point (2,-10).

6. (CI) For the curve defined by $g(x) = (\sin x + \cos x)^2$ on the domain of $0 \leq x \leq 2\pi$, determine:

   a. the *x*- and *y*-intercept(s);
   b. Show that $\frac{d}{dx}g(x) = 2\cos(2x)$.
   c. Hence, determine the first three stationary points;
   d. Determine the "nature" of these stationary points (max/min/neither);
   e. Hence, sketch the function.

7. (CI) Given the function $y = \sqrt{6x - 5}$.

   a. State the domain for the function .
   b. Find $\frac{dy}{dx}$ for $y = \sqrt{6x - 5}$.
   c. HENCE, explain why $\frac{dy}{dx} > 0$ for all values of *x* of the domain.
   d. What does this mean about the function?